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**General Technical
Report RM-164**

Tools to Manage the Past:

Research Priorities for Cultural Resources Management in the Southwest

Symposium Proceedings

**May 2-6, 1988
Grand Canyon, Arizona**

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These proceedings contain 13 solicited papers, plus 9 papers generated during the Grand Canyon workshop, designed to establish what knowledge and technology is needed to make possible more effective management of cultural resources in the Southwest. Workshops were organized around the topics: management impacts, Native American heritage, protection and preservation, site discovery and definition, public interpretation and education, key prehistoric research, key historic research, and integrated research designs.

NOTE

To produce these proceedings quickly, we asked authors of solicited papers to submit their papers in camera-ready form. Papers developed by the working groups during the week at Grand Canyon did not receive conventional peer or full editorial review. Thus readers may notice a few typographical errors, or slight differences in format. Also, the views expressed in each paper are those of the authors, and are not necessarily those of the sponsoring organizations.

Cover Photo:
Gila Cliff Dwellings, Gila Wilderness, July, 1939.
Photo by W. H. Shaffer

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1988

Introduction

Tools to Manage the Past:

Research Priorities for Cultural Resources Management in the Southwest - Introduction.

Symposium Proceedings

May 2-6, 1988
Grand Canyon, Arizona

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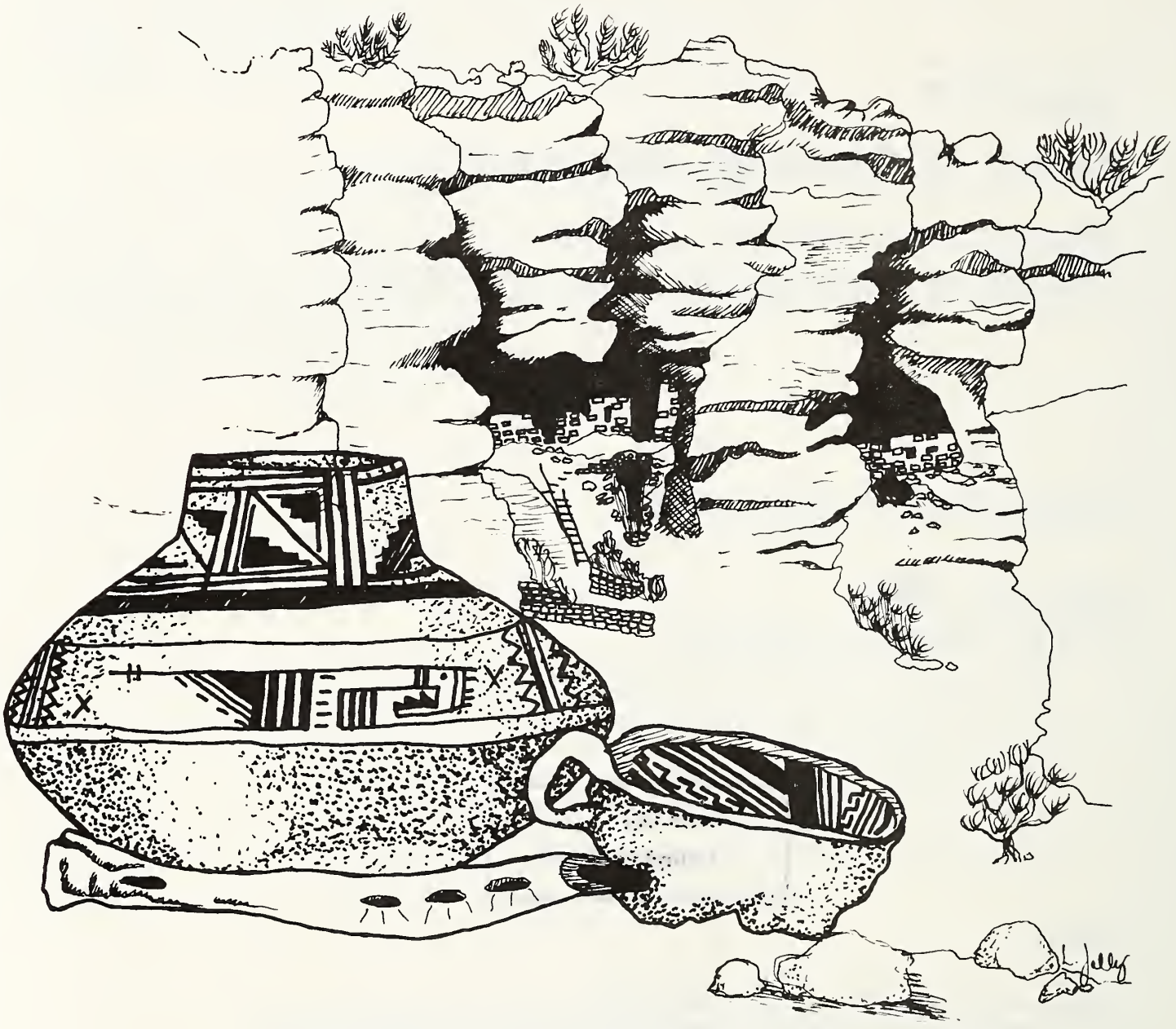
Sponsors:

USDA Forest Service,

Southwestern Region
and
Rocky Mountain Forest and Range Experiment Station



Gila Cliff Dwelling, Gila Wilderness
(drawn by Linda Jolly)

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*Presented on the opening day of the symposium.

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Introduction[1]

Judith G. Propper[2] and Joseph A. Tainter[3]

The idea to convene the "Tools to Manage the Past" symposium grew out of a 1986 General Management Review (GMR) of the Southwestern Region and the Rocky Mountain Forest and Range Experiment Station. In the opening remarks of their report the GMR team members[4] made the following observations about cultural resources:

> The Southwestern Region includes a vast array of cultural resources. They include prehistoric cliff dwellings, Pueblo ruins, Spanish Colonial and Mexican settlements, and various types of early mining, ranching, and logging sites. Many of these resources can be traced forward into modern times to contemporary Native American populations still occupying these lands. These resources are unique to North America and represent a scientific, historical, and religious treasure of incalculable value.[5]

Cultural resources also figured prominently in the team's findings. One item in their report dealt with the need to increase interpretation of cultural resources for the public. Another item dealt with the need to assess research requirements in the cultural resource management program. The team's findings in this area were as follows.

> Cultural resources are a major aspect of land management in Region 3. Plans and programs for cultural resource inventory, protection, restoration, and public interpretation are being developed. Forest Service research has historically not included programs on cultural resources research. Consequently little work has been done in identifying research needs in this area, if they exist. Programs in universities may be adequate, but it is likely they emphasize archeological aspects of cultural resources not land management considerations.[5]

In the action plan developed pursuant to the review report, the Region and Rocky Mountain Station agreed to analyze the need for a Forest Service cultural resources research program in the Southwest. This analysis would be done through a symposium addressing the topic, co-sponsored by the Region and the Station. The Station would then determine the need for such a program based on the symposium's findings and recommendations.

Planning for the symposium began in mid-summer of 1987. The planning team assembled for this purpose included representatives from the Southwestern Region and Rocky Mountain Station, and individuals from several other agencies: the Bureau of Land Management, the National Park Service, the Bureau of Indian Affairs, the Corps of Engineers, and the New Mexico Historic Preservation Division.[6] Joseph Tainter of the Cibola National Forest was designated Symposium Coordinator.

One of the first tasks of the planning team was to define the objectives of the symposium. These were derived from the Southwestern Region's overall statement of purpose (Muniz, this volume), and from the goals of the Region's cultural resource management program. The objectives of the symposium were to identify and prioritize research needed to:

1. Provide quality, on-the-ground management of cultural resources in the Southwestern Region.

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[1]Paper prepared to introduce the Forest Service Cultural Resources Research Symposium [Grand Canyon, May 2 - 6, 1988].

[2]Judith G. Propper, Regional Archeologist, USDA Forest Service, Southwestern Region, Albuquerque, NM.

[3]Joseph A. Tainter, Archeologist, USDA Forest Service, Cibola National Forest, Albuquerque, NM.

[4]The review team members were Jeff M. Sirmon (Deputy Chief, Programs and Legislation), Sotero Muniz (Regional Forester, Southwestern Region), Charles Loveless (Station Director, Rocky Mountain Station), Charles W. Philpot (Associate Deputy Chief, Research), Rex Hartgraves (Associate Deputy Chief, Administration), Larry D. Henson (Associate Deputy Chief, National Forest System), and John W. Mumma (Staff Assistant to Deputy Chief, Programs and Legislation).

[5]U.S. Department of Agriculture, Forest Service. 1986. General Management Review, August 20-29, 1986, Southwestern Region and Rocky Mountain Forest and Range Experiment Station. USDA Forest Service, Washington, D.C.

[6]The planning team members were Ken Bowman, Robert Hamre, Linda Lux, Peter Pilles, Judith Propper, Joseph Tainter, and Robert Tippeconnic for the Forest Service; Stephen Fosberg for the Bureau of Land Management; Jim O'Hara for the New Mexico Historic Preservation Division; Larry Nordby, Pete McKenna, and Joseph Sanchez for the National Park Service; Beth O'Leary and John Schelberg for the Corps of Engineers; and Bruce Harrill for the Bureau of Indian Affairs.

2. Facilitate management of other resources.

3. Provide service to the public in the following areas:

A. Contribute to the scientific understanding of Southwestern history and prehistory.

B. Develop knowledge of the past that will help avoid or solve contemporary problems.

C. Interpret the past for the public and, through education, encourage cultural resource appreciation and protection.

D. Strengthen relationships with, and promote understanding and appreciation of, contemporary cultural groups that have links to the past.

With these objectives established, the planning group asked the National Forests in the Southwestern Region, and other agencies and parties, to suggest research needs in cultural resource management. Over 50 topics were suggested, which indicated both that there was great interest in our efforts, and also that there is important research to be done in this area. After much analysis and discussion, the planning group consolidated these individual items into eight topical areas, around which the symposium was organized. These are:

1. Management Impacts. Do we understand how various management practices and land uses actually affect cultural resources?

2. Native American Heritage. Do we have adequate knowledge about how Native Americans view and use National Forest lands?

3. Protection and Preservation. How can we better protect cultural resources from loss due to pothunting, vandalism, and natural forces?

4. Site Discovery and Definition. How reliable are various inventory techniques and strategies for locating and accurately characterizing cultural remains?

5. Public Interpretation and Education. Do we know what Forest visitors want to learn about the past and what interpretive approaches and techniques are most effective?

6. Key Prehistoric Research. In order to move forward in the study of prehistory in the Southwest, what are our most critical research needs?

7. Key Historic Research. In what areas is research needed to help us understand and manage historic period resources?

8. Integrated Research Designs. Can regional research designs and coordinated efforts provide a more effective framework for cultural resource management in the Southwest?

Persons with expertise or interest in each of these areas were proposed, and invited to participate in the symposium. Eventually 57 individuals were able to attend. Several were asked to bring prepared papers to present to the symposium group the first day; these papers were to serve as a basis for further discussion. (The first-day presentations are denoted by an asterisk in the Contents.) Other participants were asked to lead or serve on work groups which would meet throughout the rest of the week, and which would collectively produce papers summarizing their conclusions and recommendations.[7] Following presentation of all work group results, participants on the last day were asked to prioritize the array of research needs, a difficult task. The results of the work groups are summarized in a later paper (Management Summary and Recommendations), along with the recommended priorities.

The conference participants were a dedicated and hard-working group. They generously agreed to give the time and effort to participate, and persisted through computer problems, organizational changes, and barbeques in freezing windstorms. They have collectively produced a fine set of research topics for the agency to consider. We appreciate and commend their work. The work group members and team leaders were as follows.

Management Impacts. Patricia Spoerl, Coronado NF (leader); Stephen Fosberg, BLM-New Mexico State Office; Joseph Gallagher, Boise NF; Ken Wilson, Six Rivers NF; Tom Lincoln, Bureau of Reclamation (Phoenix); Jon Young, Carson NF.

Native American Heritage. E. Charles Adams, Arizona State Museum (leader); Peter Pilles, Coconino NF; Edmund Ladd, Laboratory of Anthropology, Museum of New Mexico; Terry Leonard, Salt River Indian Community; Sonia Tamez, FS, Pacific Southwest Region; Elizabeth Brandt, Arizona State University.

Protection and Preservation. Martin McAllister, Archaeological Resource Investigations (leader); Mike Taylor, New Mexico State Monuments; Larry Nordby, NPS, Southwest Cultural Resources Center; Judith Propper, FS, Southwestern Region; Chris Christensen, Pacific Northwest Research Station; Dale McCormick, FS, Southwestern Region; Ken Mabery, NPS, Southwest Cultural Resources Center.

Site Discovery and Definition. Alan Sullivan, University of Arizona (leader); Luann Wandsnider, Cibola NF; Paul Fish, Arizona State Museum; Carl Phagan, Northern Arizona University; Mark Calamia, BLM-Carlsbad; Bruce Donaldson, Apache-Sitgreaves NFs; John Hanson, Kaibab NF; Emily Garber, Cibola NF; Susana Katz, Center for American Archeology.

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[7] We are grateful to James Snyder of the Cibola National Forest for assembling and disassembling the personal computers on which the conference papers were written. We express our appreciation also to Ann Baugh and the other staff members of the National Park Service Albright Employee Development Center, where the symposium was held, for their help and hospitality.

Public Interpretation and Education. Chuck McCurdy, retired NPS (leader); Paul Katz, Center for American Archeology; Linda Kelley, Tonto NF; Gary Stumpf, BLM-Arizona State Office; Diane Gelburd, Soil Conservation Service, Washington; Anne Baldwin, Coconino NF.

Key Prehistoric Research. Steadman Upham, New Mexico State University (leader); Jeffrey Dean, Laboratory of Tree-Ring Research, University of Arizona; Patricia Crown, Southern Methodist University; Thomas Cartledge, Santa Fe NF; Suzanne Fish, Arizona State Museum; David Johnson, Lincoln NF.

Key Historic Research. Joseph Sanchez, NPS, Spanish Colonial Research Center (leader); George Teague, NPS, Western Archeological and Conservation Center; James Rock, Klamath NF; David Brugge, NPS, Southwest Cultural Resources Center; David Siegel, US Fish and Wildlife Service, Albuquerque; Scott Wood, Tonto NF.

Integrated Research Designs. Joseph Tainter, Cibola NF (leader); Linda Lux, FS, Pacific Southwest Region; David Wilcox, Museum of Northern Arizona; Evan DeBloois, FS, Washington; Shereen Lerner, Arizona SHPO; John Schelberg, Corps of Engineers, Albuquerque.

The conference benefitted also from the participation of Forest Service line officers and Research Station representatives. We were joined by Sotero Muniz (Regional Forester, Southwestern Region), David Jolly (Deputy Regional Forester, Southwestern Region), Enoch Bell (Assistant Director, Pacific Southwest Forest and Range Experiment Station), Ed Wicker (Assistant Director, Rocky Mountain Forest and Range Experiment Station), and Robert Hamre (Technical Publications Editor, Rocky Mountain Forest and Range Experiment Station).

All papers prepared before and during the conference are included in this volume. There is much to choose from here: the topics range from public interpretation to site protection, from designing coordinated research to actually implementing it. A number of important management recommendatons also emerged during work group deliberations and are included for agency consideration. The papers represent the best wisdom available on what research the agency needs to do, and at the same time are a good cross-section of contemporary concerns in archeology and cultural resource management. There is much work to be done, all of it important, and most of it urgent.

Research is a creative process, not only in finding solutions to problems, but also because in finding answers we discover new questions. If at some future time another symposium like this is convened, our progress as managers and scientists will be measured by how many of these topics we have successfully addressed, and by how many new questions have subsequently arisen.

What Forest Managers Need to do a Better Job of Managing Cultural Resources[1]

Sotero Muniz[2]

INTRODUCTION

It's heartening to see such a diverse representation of scientists from so many organizations and agencies that will be working with us this week. And I'd also like to express appreciation to the National Park Service for hosting us this week in Grand Canyon at the Albright Training Center. We view the Park Service as a sister agency. We routinely coordinate activities and provide mutual support.

In the Southwestern Region of the Forest Service we have a simple one-sentence statement of organizational purpose. This statement literally guides everything we do. It is, "We exist to provide quality, on-the-ground resource management, protection, and public service." We can link the events of this week to this statement by inserting the word "cultural". What we are about this week, then, is to increase our effectiveness in "providing quality, on-the-ground CULTURAL resource management, protection, and public service."

I encourage each of you to contribute to this symposium unfettered by a need to protect us from hurt feelings. We need and can benefit from your critiques. If you disagree with our orientation, or our actions, tell us! If you have better ways for us to meet our objectives, help us to understand that there are better ways. Your counsel and critiques can help us do better. We will try hard to listen and hear what you have to say.

Dr. Ed Wicker and others are here representing the Research arm of the Forest Service. Ed will address you next and share his thoughts and expectations from this symposium with you. Suffice it to say that we in the National Forest System acknowledge the need for integrated cultural resource management research. Clarifying these research needs and some stratification by priority are key components of this symposium for me.

We have a diverse representation of archeologists, historians, and scientists in attendance. Universities in Arizona, New Mexico, and Texas are represented. A State Historic Preservation Officer is here. Archeologists representing State Museums, State Monuments, the Center for American Archeology, the Laboratory of Anthropology, and private consultants have joined us. USDI's National Park Service, Bureau of Land Management, and Fish and Wildlife Service are represented, as is the Soil Conservation Service from USDA. On the Forest Service side, three Research Stations, the California Region, and our Chief's Office join those of us from the Southwestern Region. A warm Region 3 welcome to all of you!

This impressive assemblage of talent speaks well for the partnerships that do, or can, exist. Together we should be able to clarify objectives to aid us in the best selection of priority among the choices of research and management investments we have to make.

Finally, I leave you with some questions that managers like me bring to the table. I need to understand what the end results are of our efforts and investments in the management of cultural resources. Is the objective simply to protect all cultural resource properties for all time at whatever cost? Is the objective to ensure the protection of those cultural resource properties needed to enable us to chronicle the prehistory of a particular people in a particular area for a particular time period? Or, is the objective to do whatever archeological work is needed to obtain legally mandated clearance for other activities? These different objectives lead us into different management and research responses. It simply is not clear to me what our objective should be.

In my own, perhaps simplistic, view, I envision a library of some number of volumes of Southwestern prehistory, each volume containing chapters and each chapter an outline of the prehistory of the people of an area, the period of their occupancy, where they came from and where they went, and why. These volumes might also include how they lived, what they ate, what medicines they used, what social or governmental orders they developed, what records they left. In short, what was their story?

Are the end results of our cultural resource management investments and resarch the completion of individual chapters of these stories? If yes, explain it to us managers in those terms. Then we

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1 Opening remarks at the symposium on Cultural Resources Research, May 2-6, 1988, Grand Canyon, Arizona.

2 Sotero Muniz is Regional Forester for the Southwestern Region of the USDA Forest Service, Albuquerque, New Mexico.

could understand that clearance actions, reports, excavations, and other CRM activities are contributing to the stories in these volumes of prehistory.

What I experience currently is requests for increased staffing and budget. The end results that I currently see are the investigation and clearance work that is mandated, and the recording of thousands of sites and properties. I don't see us systematically adding to the stories of prehistory. Hence my earlier question, "Is it our objective to protect all sites and properties, for all time, at whatever cost?"

If the "completion of stories" is the end result, I believe we managers could understand the objectives. Attitudes would then be shifted towards understanding and support.

Please be guided as appropriate by my remarks as you complete the workshops of this symposium. Thank you for listening.

Managing Cultural Resources: What Technology is Still Needed?[1]

Ed F. Wicker[2]

Good morning ladies, gentlemen, and friends. On behalf of the Rocky Mountain Station, welcome to the Cultural Resources Symposium/Workshop. I am most pleased for this opportunity to spend the week with you participating in discussions of such an important subject.

The material relics representing the cultures and land use of past civilizations are non-renewable resources that must be managed if they are to be available for the enjoyment and use of future generations. This resource base represents the major record of ancient mankind and linkage to present civilization. Understanding the history and prehistory of the nation depends to a large extent on our ability to interpret this record.

But reconstruction of the past is an inexact and time-consuming process. If we are to maintain the opportunity to improve understanding of our cultural past, it is imperative that we protect this resource from exploitation until scientists can evaluate and interpret its significance and value to reconstruction of the nation's heritage. One way to maintain this opportunity is through a positive, proactive cultural resources management program.

In the formative years of the Forest Service, the prevailing philosophy relating to cultural resources was one of preservation through protection. The Antiquities Act (1906) testifies to this position. Unfortunately, preservation through protection was perceived by most as synonymous with management. However, time proved this to be a false perception. As additional legislation dealing with cultural resources has evolved, we have seen a concurrent evolution of the philosophy to preservation of cultural resources through compliance with legislation. While progress is being made, we still have a way to go, and a concerned public is growing more impatient with Federal agencies entrusted with the responsibility to manage our heritage.

Although the concept of preservation still prevails, there are some current indications that the conservation concept is gaining momentum. Some of us believe that mere compliance with legislated mandates is inadequate to ensure conservation of our cultural resources for enjoyment and use by future generations. Thus, a positive, proactive concept is being advocated that will provide for the conservation of our cultural resources by integrating their management with other land use and resource management. The Forest Service is committed to this concept, but the knowledge, methodologies, and technologies for implementing the concept are not adequate.

To be successful in implementing this broader philosophy, some compromising is needed. Attitudes need to move more in the direction of conservation, and archeologists will need to assume a more active role in proactive management of these resources. Monitoring compliance to legislated mandates in itself is not sufficient.

Cultural resources are non-renewable resources of such value to warrant management. The Rocky Mountain Station is committed to this philosophy and supports a strong, positive, proactive cultural resources management program. We perceive our role in this commitment as providing the information and technologies needed to implement and maintain a successful proactive management program. Also, we encourage natural resource management agencies to grasp the initiative for such proactive management, and not be content with a reactive status.

Although the Forest Service has taken the lead role towards implementation of this proactive management concept, please do not view this workshop as just a Forest Service event. Most of you received a special invitation to attend because we believe you have something to contribute. Collectively, you represent 23 Federal, State, private, and native American organizations with needs and concerns relative to cultural resources management. Of equal significance, you represent a sampling of the scientific community. We want the Symposium/Workshop and its products to be perceived as a partnership effort of scientific community interests. We hope that, by the end of this week, through your contributions and interactions with other attendees, you will leave here with a feeling of commitment and ownership in the program.

Some specific objectives of this Symposium/Workshop are to determine:

a.) The goals of a proactive cultural resources management program;

b.) What knowledge and technologies are needed to implement and maintain such a program;

c.) What knowledge and technologies are already available to support such a program;

d.) What knowledge and technologies are needed, but currently unavailable.

All persons have visions. Some of us realize our visions through hard work, good fortunes, and assistance from our many friends. I hope we can engage in all these activities this week, and achieve a level of success we can look to with pride of ownership. With a diligent effort by each of us, I am certain success is imminent.

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[1] Opening remarks at the Cultural Resources Research Symposium/Workshop, May 2-6, 1988, Grand Canyon, AZ.

[2] Ed Wicker is Assistant Director for Research (South), Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Fort Collins, CO.

The Program: Managing Cultural Resources in the Southwestern Region[1]

Judith G. Propper[2]

Abstract.--The Southwest holds a well-preserved record of human existence going back over 10,000 years. The Forest Service's cultural resources management program in the Southwest is briefly reviewed, and a shift to a more proactive program providing greater public benefits is discussed. Research may be needed to provide National Forests with the tools necessary to fully implement this program.

INTRODUCTION

The Southwestern Region of the Forest Service consists of eleven National Forests, encompassing some 20 million acres, in Arizona, New Mexico, Oklahoma, and Texas (fig. 1). The Region is characterized by tremendous scenic and ecological diversity, stretching as it does from the deserts of southern Arizona, to the mountains and mixed conifer forests of northern New Mexico, to the rolling grasslands of the Texas panhandle. These lands are administered by the Forest Service within a multiple use management framework. Multiple use management provides for the wise use of Forest resources by the American people in a way that assures a continuing supply of these resources for future generations. Such uses include recreation, timber harvesting, grazing, mineral development, and many other types of activities.

[1]Paper presented at the Forest Service Cultural Resources Research Symposium [Grand Canyon, May 2-6, 1988].

[2]Judith G. Propper is Regional Archeologist, USDA Forest Service, Southwestern Region, Albuquerque, N.M.

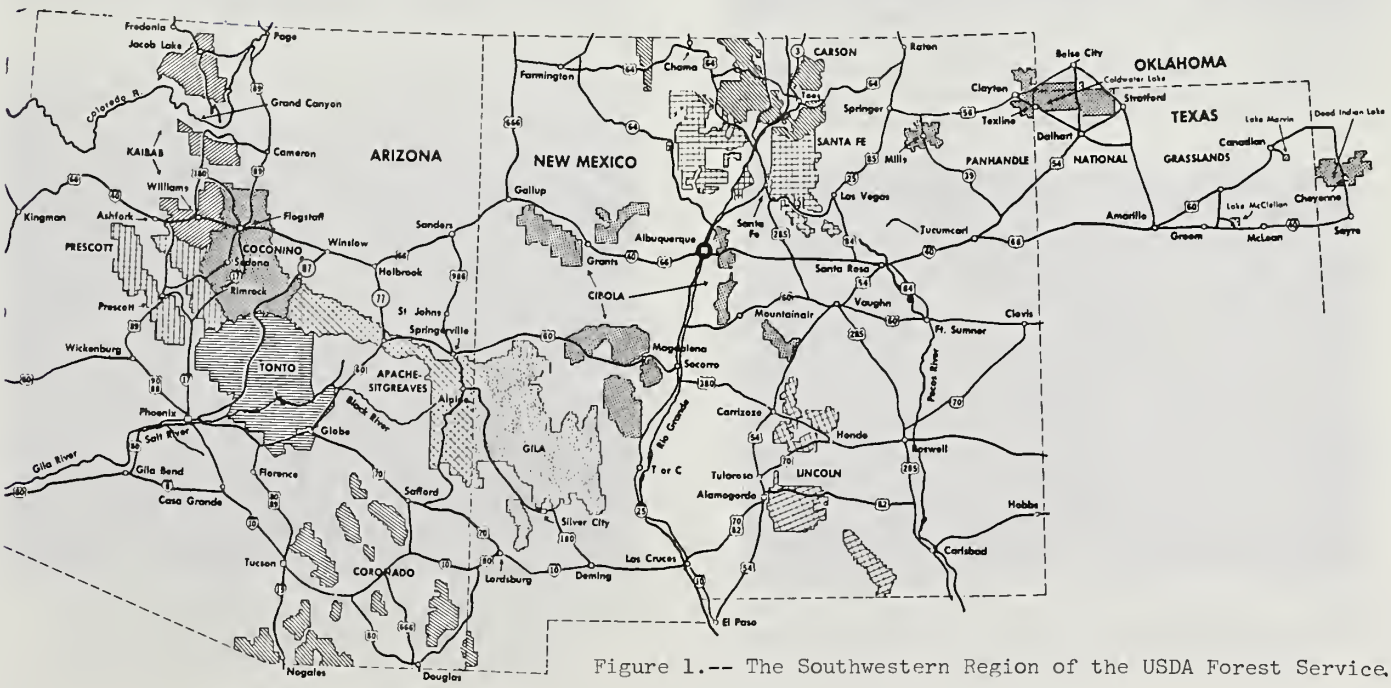

Figure 1.-- The Southwestern Region of the USDA Forest Service.

The Southwestern Region is well known for the richness and diversity of its cultural resources and contains what is probably the best-preserved record of human history and prehistory in the National Forest System. From picturesque cliff dwellings (fig. 2) and massive pueblo ruins, to fragile artifact scatters (fig. 3), to a myriad of historic period sites and structures (fig. 4), these resources document over 10,000 years of cultural adaptation and change.

Figure 2.--Cliff dwellings, like this one on the Prescott National Forest are found on many Forests in the Southwestern Region.

Figure 3.--Artifact scatters consisting of stone flakes and potsherds may be the only surface indications of past human activity.

All offer clues to the lifeways and events of the past, as individuals, families, and societies struggled to live successfully with the land and with each other. How they did this, and why they were successful or why they failed, has importance not only to our understanding of the past, but to our understanding of the present and our outlook for the future (fig. 5).

HISTORY OF CULTURAL RESOURCES MANAGEMENT PROGRAM

The Early Years

The Forest Service, like most other Federal land-managing agencies, established a formal program to protect and manage cultural resources in the late 1960's, following passage of the National Historic Preservation Act (1966). The Southwestern Region hired its first professional archeologist to coordinate this program in 1973. The 1970's were years of slow but steady growth, as national and Regional policies were formulated, and Forests developed the mechanisms to deal with the basics of legal compliance. By the early 1980's, there were professional archeologists on most Forests in the Region, and cultural resources routinely were given consideration in planning and implementing land management activities.

The major focus of the program was on project compliance, specifically field surveys to locate cultural resource sites in advance of earth-disturbing projects (fig. 6). In most cases, once located, sites could be protected through avoidance during project activities. The main outputs of the program were acres surveyed and sites located, and file drawers swelled with the accumulation of survey reports and site forms. Once located, sites were rarely revisited or investigated, and knowledge about these resources was usually limited to surface observations made during surveys.

During these years, the Region also took a number of pioneering steps to try to address broader program needs. In cooperation with the Bureau of Land Management, an initiative was begun

Figure 4.--Remains of historic cabins, found throughout the Southwestern Region, hold clues to early settlement, mining, and logging.

Figure 5.--Continuity between past and present is evident in many contemporary Native American communities in the Southwest.

to assemble and synthesize known archeological and historical data in a series of cultural resource overviews. The Region also organized several symposia to deal with such topics as predictive modeling (Cordell and Green, 1984) and site allocation (Green and Plog, 1983). Vividly aware of the destruction of cultural resources on public lands due to pothunting, the Region took the lead in efforts to bring archeologists, law enforcement officers, and legal experts together to work on this problem (Green and Davis, 1981).

On most Forests, however, the situation on the ground remained one of primarily reacting to the needs of other resource management programs and activities. Cultural resources were basically a procedural hoop in the project planning process.

Figure 6.--Field surveys to locate and record cultural remains have long been a major component of Forest cultural resource management programs.

A Time of Transition

The mid-1980's have been a time of reassessment of the Region's cultural resource management program. One result has been a strengthening of existing standards to provide better site protection. A more important result, however, has been a redefining of basic program content to include more than compliance activities.

A number of factors have been involved in bringing about this reassessment. One is the development, over the past several years, of Forest Land Management Plans. This process, which is ongoing, requires specific consideration of cultural resources and has provided new opportunities to identify priorities for non-project related cultural resource inventory, evaluation, protection, and enhancement.

Another important factor is the increasing public interest and involvement in the management of cultural resources in the Southwestern Region, including a cultural resources lawsuit in 1984. This interest has helped focus attention on the need not only to assure better on-the-ground management, but to provide greater benefits to the public in the cultural resources program.

Finally, there has been a growing frustation on the part of National Forest land managers and archeologists alike over the program's reactive nature, compliance orientation, and survey-and-avoid mode of operation. After surveying some two million acres, and recording over 20,000 sites, only around 1 per cent of those sites have been evaluated, and only a handful are currently interpreted in some way for the public. Concern over this helped create a responsiveness at all levels to the idea of redefining the program's emphasis and scope.

The end result has been a gradual adjustment in thinking about the Region's short-term as well as long-term cultural resource management goals. This has led to recognition of a broader range of priorities in the program and a committment to get on with the larger job.

MOVING INTO THE FUTURE

A Proactive Program

As we prepare to enter the 1990's, the Southwestern Region is committed to continued implementation of a balanced, proactive (rather than reactive) cultural resources management program. While legal compliance continues to be a major element in this program, it is but one aspect of our overall responsibilities as stewards and managers of the nation's cultural heritage.

The basic components of this program include the following:

1. Inventory: An expanded inventory program, addressing areas other than project locations. The

Figure 7.--Pothunters have plundered many prehistoric sites on public lands in search of artifacts to sell or display.

goal is to provide a more complete picture and a better understanding of the distribution of cultural resources across the Forest landscape.

2. Evaluation: Studies aimed understanding inventoried cultural resources, including the nature of individual sites, the relationships between sites, and the interaction between cultural and natural systems. Only through such understanding can we deal meaningfully with questions of significance and make wise decisions about what to preserve for future generations.

3. Protection: Effective site protection efforts aimed at minimizing the loss of important cultural resources due to natural deterioration, public use, vandalism, and theft (figs. 7 and 8). This will require an understanding of causes as well as effects in arriving at appropriate courses of action and will require a long term committment to protection and stabilization objectives.

4. Allocation: A program of site allocation that takes into account the special scientific, cultural, interpretive, and management-related values of cultural resources in making decisions about the use of these resources. Allocation is based on a recognition that avoidance of all sites forever is not management, but is merely an expedient practice that contributes little to our understanding of the past.

5. Interpretation: An emphasis on cultural resource interpretation and public outreach that provides opportunities for Forest visitors and local communities to learn about Southwestern history and prehistory (fig. 9). Such efforts will also contribute to the understanding and preservation of Native American cultures and other traditional cultures in the Region.

Figure 8.--Time is taking its toll on many sites threatened by deterioration and erosion.

6. Integration with Forest Resource Management: Consideration of cultural resources as a resource in the early planning stages of land management activities (fig. 10). This includes consideration of cultural resource management objectives along with other objectives. Legal compliance will be a logical by-product of this process, rather than its primary goal.

7. Partnerships: Expansion of partnerships with local communities, Native Americans, other agencies, the scientific community, and others in a coordinated effort to further the study, understanding, and preservation of cultural

Figure 9.--National Forests and other public lands in the Southwest provide unique opportunities for visitors to discover the past.

Figure 10.--Managing cultural resources as a resource presents both challenges and opportunities for Forest managers.

resources in the Southwest. Such cooperation will significantly increase the effectiveness of many individual efforts.

The Tools to Do the Job

In order to more fully implement the cultural resources management program outlined above, we may need knowledge and technologies not presently available to us. The objectives of this symposium are to determine if this is the case, and if so, to identify priorities for research that will help us move forward in this program.

Cultural resources hold the keys to the story of human life in the Southwest beyond what exists in our collective memory and in our writings (fig. 11). The study and preservation of this record of the past deserves our utmost care and our highest standards of scientific and managerial excellence. That makes this consideration of research needs a matter of great importance and great excitement.

Figure 11.--Like pieces of a puzzle, cultural resources hold clues to the larger story of human life in the Southwest and the region's remarkable cultural developments.

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Management Summary and Recommendations[1]

Joseph A. Tainter[2]

INTRODUCTION

From May 2 - 6, 1988, 57 archeologists, Native Americans, and managers met at the Grand Canyon to evaluate the need for a program of cultural resources research. The proposed program would be based in the Rocky Mountain Forest and Range Experiment Station, and concentrate on research in the Forest Service Southwestern Region. The objectives of the symposium were to identify and prioritize research needed to:

1. Provide quality, on-the-ground management of cultural resources in the Southwestern Region.

2. Facilitate management of other resources.

3. Provide service to the public in the following areas.

A. Contribute to the scientific understanding of Southwestern history and prehistory.

B. Develop knowledge of the past that will help avoid or solve contemporary problems.

C. Interpret the past for the public and, through education, encourage cultural resource appreciation and protection.

D. Strengthen relationships with, and promote understanding and appreciation of, contemporary cultural groups that have links to the past.

Although the symposium concentrated on the Southwest, many of the research topics that were identified are of national importance, and would be of interest to other Federal agencies that manage cultural resources. The participants determined that there is unquestionably a need for a program of cultural resources research in the Forest Service.

Planning prior to the symposium identified eight broad topics for organizing the conference. These were:

1. Management Impacts.

2. Native American Heritage.

3. Protection and Preservation.

4. Site Discovery and Definition.

5. Public Interpretation and Education.

6. Key Prehistoric Research.

7. Key Historic Research.

8. Integrated Research Designs.

Leading experts in these areas were invited to prepare state-of-the-art syntheses for presentation on the first day of the meeting. These presentations were to review current knowledge of a topic, and to point out areas that need further research.

The participants divided into eight work groups for the bulk of the week. The group members discussed the matters raised in the initial presentations, and developed recommendations for further Forest Service research. Each group also selected one topic as its highest priority. This would be the topic most urgently requiring attention, although the groups felt that the research branch should at some point study all the topics outlined.

The problem-areas and research topics delineated by the working groups are described in the following sections.

MANAGEMENT IMPACTS

Research Needs

- Although there have been some good studies, we still know little about how management activities and land use affect sites. We also know little about what level of disturbance will affect the information potential of a site.

- Managers need to understand secondary impacts to sites. These are impacts that result indirectly from land uses, but which may ultimately be more serious than direct impacts. Secondary impacts may arise from human use (increased accessibility and visibility) or from unforeseen physical consequences (e.g., changes in cattle trampling patterns, or subsurface changes in site structure after surface seeding).

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[1] Paper prepared to summarize the Forest Service Cultural Resources Research Symposium [Grand Canyon, May 2 - 6, 1988].

[2] Joseph A. Tainter, Archeologist, USDA Forest Service, Cibola National Forest, Albuquerque, N.M.

- Managers need to know whether current techniques of avoiding site impacts are effective.

- The effects of natural processes on sites (e.g., fire, erosion) are little known.

Research Recommendations

Highest Priority

- Study secondary impacts to sites - impacts caused by management and land use, but occurring as an indirect effect.

Other High Priority Topics

- Prepare an overview of existing impacts research to isolate research needs systematically, and to assess what technology is needed to implement a research program.

- Begin a program of on-the-ground impacts research, using defined study areas on National Forests.

NATIVE AMERICAN HERITAGE

Management Problems

- Relations between Forests and tribes tend to be institutional rather than personal. Personal contacts are much more effective when dealing with Native Americans.

- Forests often have no program of consulting Native American communities, and no staff person skilled in Native relations.

- Forests lack up-to-date information on how Native people use the Forests.

Management Recommendations

Although the members of the Native American Heritage group developed a research program for the Forest Service to consider, they felt that the research was not necessary. Their conclusion was that the steps needed to improve relations with Native Americans are already known. These steps could be implemented by the Southwestern Region (and by other Regions) without further research. This group recommended the following management actions:

- Cooperate with Native tribes to have the tribes produce up-to-date ethnographies of their Forest uses.

- Retain the services of anthropologists skilled in Native American relations. To guide Forests in improving Native relations, establish the position of Regional Ethnologist. Forests may also wish to establish liaisons to coordinate Forest-tribal relations.

PROTECTION AND PRESERVATION

Research Needs

- To curtail looting managers need to understand the motivations and perceptions of looters, and the other factors that lead people to dig for artifacts. A related matter is to understand the public attitude toward looting.

- Managers and law enforcement officials need to understand the national and international networks for distributing illegally-obtained artifacts.

- The factors that make certain sites at high risk are inadequately known.

- Baseline data need to be gathered on the extent and distribution of looting, and on the level of cultural resources law enforcement.

- There is a need to develop, and test the effectiveness of, cultural resources law enforcement training and site protection programs.

- Little is known about the effectiveness of techniques and materials used to stabilize sites.

Research Recommendations

This group split into two subgroups, one concerned with protecting sites from looters, the other concerned with preserving sites subject to natural deterioration.

Protection Subgroup. The research recommended by the members of the protection subgroup - as their only priority - is an overall assessment of cultural resources vulnerability. It consists of the following elements.

1. Study cultural resources data bases to determine the characteristics of vulnerable sites. Develop a site-vulnerability profile.

2. Ascertain public attitudes toward cultural resources management and looting.

3. Determine the motivations for cultural resources theft and defacement.

4. Develop effective protection strategies.

Preservation Subgroup. The preservation subgroup recommended a program of research into the technology of prehistoric and historic building stabilization. This program is as follows.

Highest Priority

- Develop an understanding of the physical properties of original building materials.

Other High Priority Topics

- Determine the effectiveness of current stabilization methods, and develop new and more efficient techniques.

- Study original building methods to understand the technologies and cultural values of prehistoric and historic construction.

SITE DISCOVERY AND DEFINITION

Research Needs

- Managers need to understand the nature of the archeological record. Cultural resources concepts mandated by laws, regulations, and agency practices may be incompatible with the actual nature of archeological remains. The proper unit of research and management may not be sites but past cultural landscapes. Management emphasis on sites may bias the record of past behavior that is preserved.

- Managers need to know what technology - such as Geographic Information Systems (GIS) - will assist in the inventory and management of low- and high-density archeological remains.

Research Recommendations

Highest Priority

- Determine which survey methods and technologies are most effective for discovering archeological remains at different levels of visibility.

Other High Priority Topics

- Determine the optimum spatial units of description and analysis for different kinds of cultural remains.

- Develop methods such as GIS systems for locating and recording environmental features that influenced the locations of past activities.

This group also recommended that parcels of National Forest land be temporarily set aside to conduct the proposed research.

PUBLIC INTERPRETATION AND EDUCATION

Research Needs

- Managers need detailed information on what constitutes effective cultural resources interpretation.

- Interpretation specialists need to determine educational needs in cultural resources, and to identify target audiences.

Research Recommendations

The members of the Public Interpretation and Education group identified as their only priority a two-part research program. The two elements are as follows.

1. Compile, synthesize, and evaluate existing literature pertinent to cultural resources interpretation.

2. Develop a user profile that will allow cultural resources interpretation to be keyed to visitor needs.

KEY PREHISTORIC RESEARCH

Research Needs

- Progress in understanding and interpreting prehistoric sites must come from the study of key research themes. These include studies in such matters as agriculture, social and political organization, demography, settlement, labor, economics, and past environments. The ultimate purpose of such studies is to understand why societies develop and collapse.

- The investigation of key research themes requires basic studies in such topics as past climates and environments, the distribution of raw materials, the dating of sites, and the ways in which the archeological record is formed.

Research Recommendations

The members of the Key Prehistoric Research group picked one topic - the development of reliable chronologies - as their only priority. It has three parts.

1. Develop a program to refine methods of dating prehistoric sites (e.g., by obsidian hydration, archaeomagnetism, or accelerator-mass spectrometer).

2. Develop and maintain a master data file of archeological and environmental information pertinent to questions of chronology. Use this data file to develop chronologies for localities, Forests, and the Region.

3. Develop a program to identify, retrieve, and conserve datable archeological materials, and to date such materials.

The reason for this research emphasis is that all questions of cultural resources management and research depend on an ability to determine the age of archeological materials.

KEY HISTORIC RESEARCH

Research Needs

- Cultural resource managers need to bring to public attention the Hispanic contribution to the nation's heritage. The Columbus Quincentennial provides an opportunity to study the Spanish Colonial occupation of the Southwest.

- Managers need research that will encourage public respect for cultural resources. There is great public interest in the historic settlement of the nation, and in early economic activities such as logging, mining, railroading, and ranching. Research and interpretation in these topics would generate public support.

- Progress in understanding and interpreting historic sites must come from the study of key historic themes. These include major topics such as assimilation, ethnicity, status, settlement, and subsistence. To understand key research themes requires fundamental research on techniques of study, taxonomies, and chronologies.

Research Recommendations

The Key Historic Research group recommended that the Forest Service create a Research Work Unit to conduct historical studies. These studies would benefit cultural resource management, general forest management, and public interpretation. The Research Work Unit would concentrate on the following topics.

Highest Priority

- Study Spanish Colonial history for the 1992 Columbus Quincentennial.

Other High Priority Topics

- Study late nineteenth and early twentieth century Native American use of Forest lands.

- Study Forest Service historical buildings.

- Study historical mining on Forest lands.

INTEGRATED RESEARCH DESIGNS

Research Needs

- The National Register eligibility criteria provide little guidance for evaluating sites. Sites are typically evaluated on a case-by-case basis, without a comparative perspective or a broad plan.

- Most National Forests lack a decision-support system for cultural resources data.

- Archeologists in Forest management often lack access to new technical and conceptual developments in the discipline.

- Cultural resource management in the Forest Service has been reactive: oriented toward legal compliance rather than active management. Managers need research aimed at anticipating and resolving resource conflicts.

- There is widespread misunderstanding of the dynamic nature of archeology as a social science, and of the challenge that this poses for long-term planning. Managers need research that will provide guidance for making long-term preservation decisions.

Research Recommendations

Highest Priority

- Evaluate existing cultural resources decision-support systems (data bases), and if necessary develop a new one that will allow managers and researchers to access cultural resources information readily.

Other High Priority Topics

- The Forest Service should coordinate a program of integrated research that incorporates Federal agencies, State Historic Preservation Offices, and non-government archeologists.

- Forest Service Research should develop a program to transfer new cultural resources knowledge and technology to on-the-ground management.

SYMPOSIUM RECOMMENDATION

On the final morning of the conference all participants met to discuss which of the highest-priority research topics should be started first. This decision was concerned with matters of urgency rather than importance: the participants agreed that all of the research topics are important, and the major question is what work to begin with.

A period of discussion on this matter led to a consensus on what research should be started first. This consensus was then confirmed by a formal vote. The recommendation of the conference was that the Forest Service initiate research on the following.

1. Protection and preservation of sites. Develop effective strategies of site protection and stabilization. Assess the vulnerability of cultural resources to vandalism, and conduct studies to understand the physical properties of ancient building materials.

2. Management impacts. Assess secondary impacts of land use and land management, to determine if current methods of site avoidance are providing adequate protection.

3. Decision-support systems. Evaluate existing cultural resources data base systems. If necessary, design a new one, based on Geographic Information Systems, that will give managers accurate information on the location and nature of cultural resources.

The remaining highest-priority topics from each work group were not assigned an overall order of priority, but their ranking in the formal vote was as follows: prehistoric chronology, testing alternative survey methods, Spanish Colonial research, and interpretive programs research. The recommendations of the Native American Heritage group can be put into place without further research. Although this topic does not seem to require immediate research, the participants ranked the group's recommendations quite highly.

CONCLUSION

As the Southwestern Region develops a positive program of cultural resource management - emphasizing scientific, cultural, and recreational values - we are finding that we lack many of the tools necessary to evaluate sites, to protect them, even to determine their age. The research recommended at the conference reflects the combined efforts of leading cultural resource specialists. This research is essential if we are to understand, protect, and interpret the unique heritage of the Southwest.

Management Impacts on Cultural Resources: an Assessment of Forest Service Research Needs[1]

Patricia M. Spoerl[2]

Experimental research regarding the cultural processes which impact archaeological resources is summarized and evaluated. Impact categories considered include land management (project) impacts, human (recreational) impacts, survey identification impacts, and agency impacts. Recommendations are made for Forest Service research needs regarding management impacts.

INTRODUCTION

"The study of impacts on archaeological resources can provide a scientific, theoretical, and methodological underpinning for the future of our profession." (Leslie Wildesen 1982:83)

"The archaeological record is not a safe haven for artifacts." (Michael Schiffer 1987:121)

When I began working for the Forest Service, I was told that the Forest Service did not do archaeological research. We also did not do much management although it was stated that management was the overall goal of the cultural resources program. Instead, we operated mainly in a compliance mode, with notable but sporadic attempts to really "manage" the resource. Site avoidance was practiced whenever possible; however, people seldom returned to these sites to determine if they really had sustained no impacts from project work.

Our cultural resources program has been changing rapidly in recent years with considerable effort expended upon implementing a comprehensive management program for prehistoric and historic resources. It has become quite apparent, however that the Forest Service can not really manage cultural resources without appropriate research to determine optimal strategies for site specific as well as overall treatment of the resource.

This paper deals with cultural resources management in relation to management of other forest resources. Forest Service management activities affect cultural resources in varying degrees. Logging operations impact sites and artifacts, cattle trampling can affect the spatial distribution and quantity of materials at a site, fire suppression efforts may obliterate sites, and a host of other activities which are part of multiple use management affect the forests' cultural resources.

The Forest Service has been conducting archaeological surveys routinely for almost 15 years now and around 25,000 sites have been recorded on the forests of Arizona and New Mexico. Very little excavation has been conducted, thus the vast majority of our assessments, evaluations, management strategies, and clearance recommendations are based upon archaeological data observable on the ground surface. Under ideal conditions, the kinds of archaeological materials and features, and their distribution on the surface, should reflect the ways in which prehistoric peoples used the land and its resources, as well as a site's depositional and erosional history. Distortion or destruction of this context limits our attempts to identify patterns in the archaeological record. Therefore, knowledge of the extent to which site surfaces have been modified is essential to reliable and accurate archaeological inference.

We do know that the archaeological record is not a static phenomenon. Sites have been subjected to a variety of natural and cultural processes that affect the ways in which artifacts and features are spatially distributed. Often termed formation processes (Schiffer 1976, 1987), natural or environmental processes consist of the postdepositional changes in site and artifact morphology caused by natural factors such as wind, water and erosion, while cultural processes are those where human actions affect the material

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[1]Paper presented at the symposium on Tools to Manage the Past: Research Priorities for Cultural Resources Management in the Southwest. [Grand Canyon National Park, Az. May 2-6, 1988].

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record. It is the cultural processes which form the focus of this paper.

THE PROBLEM

The purpose of this paper is to summarize and evaluate current knowledge regarding the kinds of management impacts that affect archaeological sites. Historic sites are included by implication, however most studies have focused on prehistoric sites and artifacts. A review of experimental studies involving impacts to archaeological sites was published in 1982 by Leslie Wildesen, then a Forest Service archaeologist. The recommendations made regarding future research needs are, for the most part, still valid. Fred Plog in "Managing Archeology" (1981) prepared for the Apache-Sitgreaves National Forests, addressed the need for evaluation of impacts of Forest Service activities on archaeological sites, as did McGuire and Schiffer (1983) in an overview of southwestern Arizona. A proposal to the National Science Foundation prepared in 1982 by Forest Service and New Mexico State University personnel (Upham and Green 1982) requested funding for a series of experiments on the Lincoln and Santa Fe National Forests to 1) determine the effects on archaeological sites of management and recreational activities, and 2) to measure errors in observer (i.e. archaeologists) biases that occur during site surveys and surface collections. The proposal was not funded.

The experimental work which has been completed has been on an individual site or project specific basis. Limited progress has been made in terms of understanding the factors which impact sites. We still, however, lack sufficient empirically-based data regarding what happens to archaeological resources as a result of various ground-disturbing activities, and we also lack an integrated research program with which to investigate these management impacts.

Let's look briefly at definitions. Impact is defined by Wildesen (1982:53) as "a measurable change in a chacteristic or property of an archaeological site". Schiffer (1987:121) has recently termed similar measurable changes "disturbance processes". He notes that disturbance "usually results from an activity that has another purpose; artifacts and deposits just happen to be modified or moved along the way." Impact is, however, not synonymous with damage. Damage involves changes in an archaeological site but also includes a professional judgement regarding loss of significant information. Such judgements are not applied in determining impacts. Rather they come from evaluating the impacts to determine what effects they will have on our interpretations of the archaeological record.

Impacts are determined by observation, measurement, and description. Impacts to artifacts can be measured in several ways: alteration of an artifact through compositional changes, breakage, vertical and horizontal displacement, and loss or removal from the archaeological record. Impacts may either be direct or indirect. Direct impacts are caused by an action and occur at the same time and place while indirect impacts are caused by an action and occur later in time or farther removed in space (Council on Environmental Quality 1978). Schiffer (1987:23) relates impacts to four types of variability in archaeological materials: 1) the formal dimension involving physio-chemical properties of artifacts, 2) spatial relationships of artifacts, 3) frequency of artifacts and artifact types, and 4) relational patterns of artifacts.

There are a number of ways to classify impacts. For purposes here, cultural processes are subdivided in four categories: land management (project) impacts, human (recreational) impacts, survey identification impacts, and agency impacts. Not all known studies of each type are included here; rather, the objective is to summarize the different kinds of studies which have been conducted.

CULTURAL PROCESSES STUDIES

Land Management Impacts

Management impacts include those which result from Forest Service or Forest Service authorized ground disturbing actions. Timber and fuelwood harvest are perhaps the most often referred to activities which impact sites. The effects of yarding operations on archaeological sites have been investigated in several studies. On forests in Oregon and Washington the effects of various types of yarding operations (e.g. tractors on bare ground, and cable logging on mild and steep slopes) were measured on artificially constructed lithic scatter sites (Bryant, Gehr and Flenniken 1982). A variety of problems occurred involving scheduling, sales which did not sell, and severe weather conditions which hindered the quality and quantity of results. A similar study in eastern Oregon (Phillips 1980) found differential artifact movement on different parts of a site and in different soil types.

The impacts to sites of logging over snow have been investigated in a number of places including, in this Region, on the Coconino National Forest. The most comprehensive study was completed in 1984 in Oregon where the impacts to two large lithic scatters were measured (Philipek 1985). Artifact displacement, loss and breakage were considered minimal in over-snow logging with sufficient snow depth, low temperatures and short duration of operations.

Impacts to sites from scarification, the process of mechanically loosening top soil in preparation for regenerating a timber stand, have been examined in Idaho by Gallagher (1978). He

placed 396 steel washers in 99 postholes up to 6 inches deepand found that fourteen percent of the washers were horizontally displaced, 5 percent were vertically displaced, and 36 percent were lost (and not found even using a metal detector).

DeBloois, et al. (1975) examined impacts of pinyon-juniper chaining, that is the uprooting of unwanted trees using mechanical equipment and long chains. In their study, 367 artifacts were placed in test squares. Only 53 percent of the artifacts could be relocated, and approximately one third of these were undistrubed. Hoase (1983) examined the types of sites most susceptible to adverse impacts from chaining as well as methods for reducing or eliminating its disruptive effects. Given the severe impact to small and shallow sites, he proposes a method for protecting sites by creating islands of unchained areas (1983:160).

Cattle trampling, trailing, and grazing can impact archaeological materials, and there are examples of cattle impacting historic standing structures by rubbing. Several studies have been initiated. In one, Roney (1977) concluded that horizontal displacement of artifacts by cows was less severe than commonly assumed although almost half the artifacts used were damaged and 95% of them disappeared from the surface inventory as a result of intensive trampling. In another, Logsdon (1976) established 2 meter^2 test plots in a cow pasture near Casper, Texas. After 50 days in the pasture, only 193 of the 242 flakes were recovered. Eighty-one (42%) of these had been damaged through breakage and fractures.

Cattle trampling, as well as trampling by other animals and humans, generally occurs in patterned ways by creating definite path (or trail) and non-path areas. Experiments on the effects of trampling have been conducted by archaeologists in diverse geographic locales although they have identified similar kinds of processes. Studies have demonstrated both vertical and horizontal artifact displacement, the extent of which is somewhat predictable (Gifford-Gonazles 1985, Goerke 1981, Villa 1982, Wilk and Schiffer 1979). Impacts appear to be dependent upon the types of cultural materials, the intensity of trampling or treading, depth of artifacts, and the compactness of the site's substrate. (Gifford-Gonzales 1985:817, Wilk and Schiffer 1979).

Impacts of mechanically crushing brush on the Prescott National Forest (using a Marden Brush Crusher) were investigated by Wood (1979). Mechanical brush treatment is sometimes used for chaparral control or conversion to grassland. Actual sites were used in the tests along with burial of ceramic flower pots to evaluate subsurface impacts. Eighty-six percent (86%) of the surface artifacts were impacted in some way with the most common impact being loss from the surface inventory. Overall, the brush crusher produced four times as much impact to surface materials and structural components as did natural factors at the control site.

Numerous experiments involving impacts of plowing and other modern agricultural practices have been conducted which are relevant to Forest Service vegetation manipulation activities in the Southwest (c.f. Medford 1972). The most recent study, by Odell and Cowan (1987:480), substantiates conclusions reached in a series of previous studies of artifact movement in the plow zone, and documents the enormous effect of tillage on the archaeological record. Plowing often greatly increases the surface size of sites while decreasing artifact density (Odell and Cowan 1987:481, Roper 1976:373); vertical artifact movement varies by artifact size with larger objects more likely to be brought to the surface than smaller ones (Lewarch and O'Brien 1981); and artifact breakage is common (Mallouf 1982:80). While the Forest Service does not undertake plowing per se, we do engage in comparable surface and subsurface soil mixing and disturbing activities.

Use of mechanized equipment in fire suppression activities obviously can impact archaeological materials, and fire itself can destroy sites with combustible materials such as log cabins or roof beams in pueblos. The La Mesa fire near Bandelier National Monument in 1977 (Traylor et al. 1979) and several fires in the Coconino and Pinnacles National forests (Pilles 1984) have enabled studies of equipment impacts, increased site visibility, and artifact alteration because of high fire temperatures.

Prescribed burning is becoming a common management tool for fuels management, wildlife habitat and silvicultural improvements. Several researchers have examined the effects of prescribed burning upon cultural resources (Jones and Euler 1986, Manuel 1980) although these studies have not been particularly successful. Fire management and soil studies indicate that potential impacts to cultural resources depend on several factors: the intensity of heat, duration of heat, the amount of fuels on a site, and the penetration of heat into the soil. It appears that the conditions under which most prescribed fires occur generally would not result in unacceptable impacts to archaeological materials (such as artifact spallage or fracture); however, given the damage observed from natural fires over sites and artifacts (Burgh 1960, Switzer 1974), these impacts need to be quantified more rigorously.

Although not commonly associated with the Forest Service, the presence of lakes and rivers in national forests necessitates some consideration of the effects of flooding and inundation on archaeological sites. A cooperative effort of the US Army Corps of Engeneers, US Bureau of Reclamation, US Soil Conservation Service, and National Park Service (Lenihan et al. 1981) included a wide range of experiments

designed to assess the effects of water on archaeological resources and the best ways to mitigate the negative effects of water impoundment on these materials. These studies provide a good basis upon which to expand inundation experiments and to review methodologies appropriate for related impact studies.

Many other management activites which impact cultural resources have not been investigated. Road construction and maintenance is one which readily comes to mind. In addition, the indirect impacts of Forest Service management have rarely been formally examined.

Human Impacts

Virtually every study mentioned above and most others I reviewed observed that, while the particular impacting agents being examined did affect archaeological sites, site vandalism represents the greatest impact to sites in general. The extent of vandalism in the Southwest has been widely documented (McAllister 1979), and this topic is also being considered in "Protection and Preservation" [work group], however some consideration is necessary here because of the need for experimental research to determine the kinds of actions which may deter people from vandalism (signs, threat of law enforcement, education) (Lyneis et al. 1980).

Accessibility and visibility appear to be the two main factors responsible for human impacts to sites. In the Little Colorado drainage of Arizona, Lightfoot (1978) and Francis (1978) found that almost one third of the variability in some expected artifact classes is the product of removal of materials from sites, and that sites within 1/2 mile of roads and near campgrounds and picnic areas appear to have been subjected to more surface collection than those further away. Other researchers have reached similar conclusions (Schiffer and Gumerman 1977:295).

Site disappearance due to high recreation use has been documented on the Sawtooth National Forest (Gallagher 1984). Also, recreational collecting has resulted in the presence of virtually no portable artifacts on many sites in southeastern New Mexico as documented in the Brantley Reservoir area during archaeological survey for the Bureau of Reclamation (Henderson 1987).

Even child's play has been examined in terms of the creation of features out of previously disturbed artifacts (Hammond and Hammond 1981), and Schiffer (1987:75) cautions that odd associations of artifacts created by "child's play refuse" are often misinterpreted by archaeologists.

Site Survey Impacts

The archaeological survey is the most frequently used research tool in Forest Service cultural resource management and often forms the basis of our knowledge of much of prehistory in the Southwest. If, however, different archaeologists do not consistently recognize, identify and record the same types of archaeological information, then interpretations regarding cultural variation may be a result of the ways in which surveys are conducted rather than the archaeological record itself. "Site Discovery and Definition" is the subject of another work group, however experimental research is needed on this topic also. Plog, Plog, and Wait (1978:391-393) have demonstrated that 90 percent of the apparent variation in site density between 20 survey projects in the Southwest could be explained by the labor invested in the fieldwork. Differences in crew training, spacing and site expectations need to be measured because each has the potential to affect the reliability and interpretations derived from surface archaeological data.

Artifact collection over many years can lead to drastic changes in a site's surface. Inferences drawn from these sites at different times also vary (Ammerman and Feldman 1978, Henderson 1987, Schiffer 1987). In general, artifact variability decreases through time with repeated collection thus making sites appear more homogenous than they actually are, and in the Southwest sites often appear older because the decorated pottery types are collected first (Ravesloot and Spoerl 1981). Systematic review of collections, many of which have been obtained over a more than 50 year time span, is essential from the perspective of both management and archaeological interpretation.

Related to the above, is the issue of developing better strategies for locating sites. Surface visibility varies tremendously depending upon local factors such as vegetation, soil accumulation, alluvial deposition, and weather conditions. Test pits and shovel testing may be appropriate in certain forested areas. The validity of test pit sampling has been examined in some areas (Nance and Ball 1986), and the applicability of shovel tests has been assessed in forested areas throughout the country with varying results.

Agency Impacts

Agency management goals and philosophies and the differences among them may impact cultural resources (Czaplicki 1986). The National Park Service has long held a strong preservation philosophy, and research of its parks and monuments, which is then used in public education programs, has been an important component of the cultural resources management program. The generally restrictive use of Park Service lands may make it easier to control impacts to sites

than multiple-use oriented agencies such as the Bureau of Land Management and Forest Service where site avoidance has been the main strategy. The Bureau of Reclamation carries our inventory and protection activities although it deals mainly with mitigation programs as does the Department of Defense. The extent and manner in which legislation is implemented varies by agency, and these kinds of management impacts must be considered, particularly with increasing cooperation and partnerships among these agencies.

All agencies practice a certain amount of site avoidance in their cultural resources programs, however little investigation has been conducted to determine if measures to avoid impacts to sites are actually effective. Physical impact avoidance techniques include actions such as earth burial, rock coverings and fencing. The University of Mississippi Center for Archaeological Research (Thorne et al. 1987) recently conducted research on site preservation technologies by means of a questionnaire sent to over 400 archaeologists and managers in Federal service. Various impact avoidance techniques were reviewed such as burying sites with sand, stone, gravel or concrete (and the morphological changes which may occur); bank and site stabilization through use of rock berms, retaining walls and revegetation; and various other techniques such as fencing, gabions, and signs. The general conclusion was that site avoidance does not necessarily equal site preservation, and that site preservation is something for which we have only noted the outward appearance of a site rather than the potential impacts of the preservation techniques (1987:67). Preservation in many cases will be more costly than other management options. It is interesting to note that the Reservoir Inundation study reached a similar conclusion in stating that "Both resource managers and archaeologists should also understand that site protection is rarely a less expensive option than field testing and limited excavation" (1981:8).

In sum, there has been very little experimental research on management impacts particularly in relation to the tremendous amount of other cultural resources compliance work completed at the federal, state and local levels. Most of the hypotheses which have been developed for experimentation have not been quantified, therefore the results are not replicable. These research efforts also suffer from the use of poorly defined methods of evaluating impacts; thus, the conclusions are based on inadequate definitions of the kinds and nature of impacts. Impacts may be referred to as minimal, moderate, extreme, insignificant, or not as bad as expected.

There has been little attempt in most cases to incorporate related archaeological studies or relevant environmental research, thus each experiment often stands as an isolated entity rather than being integrated into a broader impact analysis framework. These existing studies should, however be carefully reviewed to glean information on how to more effectively approach impact experiments. Most importantly, we need to go beyond simply identifying impact types and attempt to quantitatively assess them, especially if we are to actually use the results of experimental work to evaluate potential effects to archaeological sites.

RESEARCH NEEDS

It may be useful at this point to consider archaeological data and experimental research needs at three levels (as developed by Lenihan et al. 1981 in the Reservoir Inundation Study). First, there are artifacts and artifact assemblages, the material remains that comprise a site. Impact studies at this level would include experiments regarding artifact displacement, loss, and alteration. Most experimental research has been done at this level. Second, there is the archaeological site or activity locus. The site includes artifacts, features, and the environmental context of past use. Impact studies regarding sites could focus on soil movements which alter spatial and stratigraphic contextual relationships. Few studies have been accommplished with the site as the primary focus, and site survey experiments would be relevant here. Third, there is the regional level including the environmental data base, settlement and resource use patterns, and interaction and exchange networks.

This hierarchical scheme was developed in the course of impact studies for the Reservoir Inundation Study because it makes explicit the proposition that cultural values consist not only of discrete entities such as artifacts and sites, but also of the relationships among these entitites. The loss of archaeological data at any level of the hierarchy affects the quality of information obtainable from the other levels. This is particularly important for Forest Service management because we are not merely concerned with the movement of a few or many artifacts from one place to another, but rather knowledge of the whole range of relationships is essential to understanding the past and to proper management. We can consider the relationships (spatial, contextual) of artifacts and features that comprise a site, the relationship among sites comprising a settlement system, and the relationships between a settlement system and its environmental and cultural context.

Range allotment management plans can serve as an example here where all levels of information and impact are relevant. Such management plans may call for placement of new tanks and pipelines, the opening of access roads, pasture fencing, vegetation manipulation to create additional grazing areas, and grass seeding. At what distance from a site should a new tank be placed to avoid unacceptable levels of cattle trampling on the site area?; will fence construction

neccesitate formation of new cow trails which may cross sites and lead to increased compaction, artifact movement, or erosion?; to what extent will new access roads increase the potential for site vandalism and what mechanisms may help discourage such actions?; will seeding of a site distort spatial relationships of artifacts at a later date?; and, what will be the effect of these management activities on the overall archaeological record of an allotment area?

As Wildesen says (1982:75), we need to know how much, how bad, how long, and how rapid. With this information we can decide which impacts are acceptable and which may result in a significant loss of archaeological information (the "threshold of concern" as she terms it (1982:75).

As a result of management impacts research, we should be able to define the range of potential impacts from certain kinds of activities and predict the regularities of these impacts on artifacts, sites and areas. This information can then be evaluated to determine acceptable limits of impacts for various activites and sites based upon the type of archaeological resource, its significance, type of impact, and physical composition of a site area. Archaeologists should be able to say to managers: based upon experimental research an archaeological site will not be impacted if prescribed burning is conducted at temperatures of less than XXX degrees with a sparse understory; at another site the heavy fuel loading must be reduced to avoid high fire temperatures and potential impacts to artifacts. Or, impacts to sites will not be significant if over-snow logging is conducted under conditions of XX amount of snow on the ground with temperatures below XX degrees and done during a XX week period in early morning hours. Without reliable impact information we will continue to simply avoid sites which seldom may be the optimal management strategy.

At this point, we have a general idea of what we do and do not know regarding the potential impacts of various cultural processes. Therefore, the following general research recommendations are made.

1) We need experimental research regarding the nature of specific impacts on archaeological materials and development of a program of integrated impact research. Real as well as synthetic sites should be used, and experiments should include actual ground disturbing projects as well as simulated ones. Studies under controlled conditions can be supplemented with actual projects (e.g. timber sales,) however replicability must be ensured to produce results which can be applied to a broad range of factors not merely one timber sale in one area. Factors which can be controlled include kind and number of artifacts used, size of artifacts, location, and type and frequency of impact (cf. Odell and Cowan 1987:457).

The Forest Service site allocation scheme (Green and Plog 1983) allows for the experimental use of certain sites. Allocation involves the assignment of sites to various categories based on value, including research, interpretation, preservation, removal from management, and experimental use. On the Coronado National Forest we have a number of sites appropriate for experimental use because of a unique land exchange situation.

Experiments can be done on a function specific basis such as timber harvest methods, although there should also be an emphasis on more generalized studies appropriate to a number of functions. As an example, compaction studies can be applied on a number of forests because compaction may be caused by animals, heavy equipment, people, and natural deposition. Other examples include experiments on the impacts of mechanical equipment on soil mixing, and investigation of various effects of trampling and treading.

To be successful, impact research must be conducted in the context of an integrated research program. Individual experiments on a site, project or forest specific basis, as most previous ones have been, will not provide us with the kinds of objective and replicable data necessary to apply results on a regional scale.

2) We need to incorporate data obtained by environmental scientists regarding hydrology, soils, vegetation, and geomorphology into research on cultural processes and impacts.

Much research has been conducted by environmental scientists regarding erosion, compaction, soil and vegetation disturbance and sedimentation associated with ground disturbing activities such as timber harvesting, grazing and recreation. Archaeologists can use these data and apply similar methodologies to archaeological impact studies. As an example, soil and vegetation research can be used to evaluate potential impacts of prescribed fires. Such results would have widespread applicability to Forest Service management.

3) We need field studies on the effectiveness of various techniques intended to prevent vandalism, along with behavioral research on vandals. This topic is also considered in "Protection and Preservation".

4) We need methodological research regarding the archaeological record as reflected by survey standards and site observation and recording. This becomes a particularly important management concern if sites present are not located during surveys, or if too much time/money/effort is placed in areas of low site density or surveying in inappropriate conditions with crews with inadequate training. We now have about 15 years of survey reports and data to use as a basis for such study.

5) We need to to ensure that a long-term comprehensive management impacts program is implemented with follow-up work conducted, and the publication of results.

In conclusion, impacts to the archaeological record should be described and evaluated. We base much of our management on what we see on the ground surface, and we need to know the extent to which this information is reliable. We know sites are not pristine, but we have to be able to more effectively judge the extent to which formation processes have affected them and will affect them because of specific Forest Service management. We need to identify acceptable levels of impacts that are compatible with management activites and still allow for the preservation of archaeological information.

The first step is to formulate and conduct a systematic program of research to understand the nature of impacts associated with Forest Service management activities, and then to determine how most effectively to minimize these impacts to the archaeological record.

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Research Agenda for Management Impacts on Cultural Resources[1]

Stephen Fosberg[2], Joseph Gallagher[3], Thomas Lincoln[4], Patricia Spoerl[5], and Kenneth Wilson[6]

INTRODUCTION

This research agenda is organized as an addendum to the paper entitled "Management Impacts on Cultural Resources, An Assessment of Forest Service Research Needs" by Patricia M. Spoerl (this volume). The agenda expands upon research recommendations made in that paper and provides information regarding the goals and objectives, knowledge and technology, and research issues needed to address the problems of understanding the nature of management impacts to cultural resources.

The purpose of this research agenda is to provide a framework for instituting a research program to provide archeologists and managers with the information needed to anticipate and systematically manage impacts caused by management activities and natural processes on cultural resources. Information on impacts will ensure a proactive approach to cultural resources management in that specific kinds of impacts may be predicted and appropriate measures taken to minimize these impacts. In addition, acceptable impacts resulting from various management activities can be defined which will not adversely affect significant values of particular cultural resources.

The result of impacts research is envisioned as a series of technical reports which provide specific information on anticipated impacts to cultural resources from specific management activities.

The "state of the art" with regard to management impact research is minimal (Spoerl, this volume). Experimental studies on management impacts have generally been on a site- or project-specific basis, and have not included the kinds of objective and replicable data necessary to apply results on a regional scale. There has been little attempt to incorporate related archeological studies or relevant environmental research. so each experiment usually stands as an isolated entity rather than being integrated into a broader research framework. The studies which have been completed should, however be carefully reviewed and evaluated to form the baseline from which to proceed with an integrated research program.

Five research recommendations were made in "Management Impacts on Cultural Resources: an Assessment of Forest Service Research Needs" that outline directions management impacts research

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should pursue. One of these, treating vandalism and site-protection study needs, is not included here because the issue is given detailed consideration in another work group (Christensen et al., this volume). Site protection is, however, a significant component of managing impacts to cultural resources, and can easily be integrated into a broader Impacts Research agenda. The other four recommendations will be expanded upon in what follows.

We need experimental research regarding the nature of specific impacts on archeological materials, and development of a program of integrated impact research. We need to incorporate data obtained by environmental scientists regarding hydrology, soils, vegetation, and geomorphology into research on cultural processes. We need methodological research regarding the archeological record as approached by survey standards and site recording techniques. And, we need to ensure that a long-term, comprehensive management impacts program is implemented with follow-up work conducted. The nature of much of the experimentation necessitates a long-term commitment to examine the impacts of various processes on the archeological record although specific short-term studies also form an important component of the program.

BASELINE DATA NEEDS

Prior to development of a viable research program, baseline data must be collected and analyzed. Such data are needed to make more informed cultural resource management decisions. Development of these baseline data involves both survey and inventory work and research, and should be conducted as a joint effort of the Forest Service management and research branches. Immediate data needs are: (1) completion of an overview/analysis of experimental research; (2) identification of "Comprehensive Study Units" and identification of cultural resources appropriate for impacts research; and (3) resubmission of the 1982 National Science Foundation experimental research proposal.

A comprehensive and detailed overview and critique of all experimental studies carried out to date must be undertaken. As Wildesen (1982: 53) points out, "Unfortunately, much of the 'literature' on impact studies exists as papers at meetings or in journals of limited circulation." Nearly all of these studies have been sponsored on a sporadic basis by Federal agencies and have not been published in the formal literature. Consequently, researchers will have to obtain copies of these unpublished reports from individual field offices, and will need to analyze which approaches are worth pursuing and which should be abandoned. The conclusions of this analysis should suggest to management which experimental designs to incorporate into the formal Forest Service research program on management impacts.

Another objective of the overview/analysis is to assess what technology is needed to implement the impacts research program. Existing laboratory and field methodologies and technological needs should be reviewed in terms of the impacting agents themselves, as well as in terms of the science of archeology. Development and scoping plans for designing equipment or technology necessary for measuring changes in site conditions or artifactual content should be included.

Identification of "Comprehensive Study Units" is an important component of the research program effort, and could be coordinated by the management branch. The units would consist of relatively large geographic areas containing cultural resources which are scheduled for some type of management activity. Management activities in these units would be monitored on a long-term basis, as would be the use of the units for experimental studies. Each forest could be polled on the availability of such areas. From the list generated, the areas can be evaluated in regard to overall management and research objectives to identify which geographic areas will constitute the Comprehensive Study Units. Defining these units should be based on the following factors: cultural resource density, distribution and quality; extent of previous impacts; resource accessibility; degree of proposed future development; resource applicability and availability to experimental research; and compatibility with Forest plans.

Knowledge of general site types within an area would be necessary to develop specific kinds of impact experiments. The identification of Comprehensive Study Units amenable to experimental work would also entail the identification of specific cultural resource sites outside these areas which might be appropriate for impacts research.

Reviewing, updating, and resubmitting Upham and Green's (1982) experimental research proposal to the National Science Foundation (NSF) could lead to a variety of experimental data. Also, there is a potential for the development of a partnership among the Forest Service, an academic institution, and the National Science Foundation to carry out some research without relying solely upon Forest Service research funds. While the existing proposal would not require complete reworking, revisions should emphasize the priorities established in this paper.

RESEARCH ISSUES

Under the rubric of Management Impacts, the potential for research is so broad that it is necessary to reduce and classify the possible topics based upon kinds of impacts and importance to Forest Service management. The Management Impacts Group conceptualizes the Research Issues in three broad classes: (1) programmatic issues; (2) functional issues; and (3) generic issues.

This categorization reflects the authors' perceptions of how to address research questions and how different lines of research should be carried out (table 1).

Programmatic issues concentrate on those effects which are further removed in time and space than immediate project impacts. Areas of programmatic concern include secondary impacts, protection/avoidance treatments, and long-term impacts-monitoring programs within Comprehensive Study Units. Functional issues are those dealing with traditional Forest Service program areas such as timber, range, fire, and recreation. Generic issues are topical categories that focus on a class of discrete impacts such as soil mixing, trampling, compaction, and thermal alterations, which are impacts caused by a variety of functional activities. Functional impacts tend to be program-specific, while programmatic and generic issues crosscut Forest Service functional activities.

Table 1.--High priority research issues in impacts research.

Programmatic Issues:
Secondary Impacts to Cultural Resources
Comprehensive Study Units - Inventory and Monitoring
Avoidance/Protection Measures
Functional Issues:
Impacts of Fire on Cultural Resources
Impacts of Timber Management on Cultural Resources
Impacts of Range Management on Cultural Resources
Generic Issues:
Impacts of Soil Mixing using Mechanical Equipment
Impacts of Human and Animal Trampling and Treading
Impacts of Erosion on Cultural Resources

RECOMMENDATIONS OF THE MANAGEMENT IMPACTS GROUP

Secondary Impacts to Cultural Resources

The Management Impacts group recommends that the Programmatic topic of Secondary Impacts receive priority consideration. This recommendation is made because: (1) we expect that managers will continue to use site avoidance as a management strategy, leaving sites at risk within project boundaries from indirect impacts; and (2) sites are at risk from activities such as hiking, boating, hunting, and touring which have no direct impacts themselves, but which have varied and poorly understood indirect effects. The latter is becoming a critical concern because of the current high recreation use of National Forests and the potential increase in recreational activities with the Recreation Initiative.

The goals of proposed research on secondary impacts are: (1) determine the scope and scale of secondary impacts that occur across all functional areas (although the focus will be on recreation-related impacts initially); (2) determine which cultural resources are at greatest risk from secondary impacts; and (3) develop techniques which managers can use to reduce secondary impacts to a level where their effects do not alter National Register characteristics.

Analyses of secondary impacts should stress an integrated study approach encompassing many of the thematic issues presented by other work groups at the Symposium. Study areas could include: (1) interpretative/educational factors and their effectiveness in preventing secondary effects; (2) site protection and preservation technologies and how human behavioral data can enhance these efforts; and (3) site discovery/definition concerns, especially where secondary impacts could alter or entirely remove subtle cultural resources from the landscape.

Research results that would produce information meaningful to managers would require three to five years to acquire, and could require a second five-year period to observe and assess accurately long-term, persistent secondary effects.

Comprehensive Study Units

The Southwestern Region needs to obtain data on the variability and extent of impacts on a wide range of archeological sites within confined geographical areas. This information will assist in making informed program management decisions for future development. Comprehensive Study Units, in which such investigations would be conducted, should be between 2000 and 6000 acres in size, and should contain a variety of archeological resource types representative of the area. These areas should have no or little past development, so that site analyses, interpretations, and significance determinations can be undertaken with consistent and comparable data. Development programs and management activities should proceed under current cultural resources guidelines, so that potential impacts to cultural resources can be measured under standard Forest Service practices. Impacts to sites, site avoidance, site protection, and mitigation measures should be applied in the traditional manner, so that cumulative impacts can be assessed. This program can, and should, be applied to other aspects of cultural resources research, so that a wide array of topics can be addressed (e.g., research issues, site definition, vandalism). A minimum of three Comprehensive Study Units should be established in the Region to ensure good variability in areas and activities, as well to as establish some comparability among impact studies.

Archeological sites in the Study Units will be inventoried and recorded to the best current survey standards. Inventory would be an initial aspect of study which could involve experimental research in various survey and site-recording techniques. Mandated compliance obligations will be met by making significance determinations and, where applicable, National Register nominations. Because of the continuing nature of many Forest Service activities, a time period of at least fifteen years is recommended to conduct these studies. Sites will be monitored on a recurring and scheduled basis to assess changes, both natural and cultural, that might have occurred since the previous monitoring.

Experimental studies should be developed within the framework of the Comprehensive Study Units and should include creating "sites" for specific problem analyses. At the conclusion of the study an impact assessment will be prepared which will describe and evaluate impacts to cultural resources caused by routine Forest Service activities. This should be a significant contribution to effective management of cultural resources.

Protection/Preservation Efforts

A variety of actions may be undertaken to avoid impacts to sites including burying sites with various materials, bank- and site-stabilization, and revegetation. Research on this topic would focus on potential impacts to internal site structure which may occur from avoidance and protection strategies (e.g., whether the weight of sand or stone affects the distribution of subsurface artifacts; whether these materials introduce new matter which may alter the chemical composition of organic materials; and the erosion potential of the covering materials).

Test sites would be placed in a variety of environmental situations with a variety of coverings. Experiments would use both manufactured sites, and actual sites that have been partially excavated. Acquisition of "before" information on the nature of the site, and on soils and other environmental data, would be necessary. Experiments would be long-term (e.g. five to fifteen years), with impacts measured periodically.

FUNCTIONAL ISSUES

Fire Management

Fire and fire management activities have the potential to impact cultural resources such as chipped stone, ceramics, shell, basketry, bone, carbon samples, and floral and faunal materials. A critical research question associated with fire relates to the impacts of heat on cultural materials, and on natural materials in a cultural context. Does heat change the physical and chemical characteristics of artifactual materials? For example, what effect do varying levels of heat have on obsidian sourcing and hydration readings? These questions regarding potential impacts on archeological information are very important in relation to such fire management activities such as prescribed burning, back firing in fire suppression, and maintaining fuel loads on cultural resource properties.

Fire impacts research could be completed in a relatively short amount of time, about one to two years.

Range Management

Studies done to date on the effects of range management on cultural resources have been by Goerke (1981), Lightfoot (1978), Logdon (1976), and Roney (1977). However, these studies have generally failed to rigorously control the independent variables which condition the severity of grazing upon cultural resources.

Under this proposed experiment, manufactured, artificial sites would be produced along the lines suggested by Upham and Green (1982). Holding the cultural resource component constant, grazing conditions to be varied would include: degree of soil compaction, moisture conditions, size and type of soil constituents, animal types, numbers of animals, the number of passes over a site, the size and weight of the animals, and the context of the site.

A fast track (accelerated experiment) and a slow track would be followed to measure the results. The fast track would concentrate the numbers of animals in a small area to simulate effects over a longer period of time. The slow track would measure changes utilizing the density of animals and conditions expected in the real world.

Observations to be made would include examining edge damage, and comparing fractures and bulbs of percussion. Vertical and horizontal displacement or disappearance would be calculated by periodic remapping and comparison to initial piece plotted maps. Weight measurements and binocular microscopes would be used to measure changes. The research would specifically seek to answer the question whether impacts can be distinguished from intentional human modifications.

Timber Management

Research on timber management involves studying the overall impacts to cultural resources by timber management activities. These activities include falling, yarding, site preparation, and plantation management. Secondary effects that should be studied are impacts to cultural materials that are adjacent to or surrounded by timber harvest units. We have been creating

cultural resource islands within timber stands by our standard practice of flagging and avoiding sites. It is suspected that impacts from windthrow might be one result of creating these islands.

This comprehensive study would occur over a five-year period to insure that a wide array of logging systems and silvicultural prescriptions are tested within several different ecological/environmental settings. There is a potential for cooperation between logging companies and the Forest Service in conducting these studies.

GENERIC ISSUES

Similar kinds of impacts may occur in different types of Forest Service activities. These can be investigated as topical research questions which crosscut a series of functional areas. The functional nature of Forest Service management (e.g., range, fire) may not always be the most effective, economical, or even desirable method of conducting research. Generic issues can most effectively be joined with natural resource research or within Comprehensive Study Units, and can thereby be accomplished either as individual experiments or as components of related environmental studies.

Soil Mixing Studies (Mechanical Equipment)

Disturbance of archeological sediments can have tremendous effects on the distribution of archeological materials and the structure of sites. Forestry literature contains information on the kinds of soil disturbance that occur as a result of timber harvest. This literature can be drawn upon in designing and implementing research on the impacts of soil-disturbing activities, both from timber harvesting and from other Forest Service practices such as road construction and vegetation manipulation through mechanical treatments.

Trampling/Treading Studies

Trampling and treading occur through the presence of animals (e.g. cattle, horses, sheep) and humans with similar kinds of impacts. Concentrated areas of compaction and disturbance are created with impacts that can be relatively well-defined and which occur in relatively patterned ways. Identifying these patterns would be the focus of experimentation, and these studies would build upon existing ones conducted in this country and abroad. The overview/analysis would be instrumental in identifying the most productive lines of research.

Erosional Impacts

Forestry and range literature contain a considerable amount of information dealing with both direct and indirect effects of erosion. Because erosion generally occurs some time after a specific activity has been completed or at a location distant from the actual activity, its impact on cultural resources is not always recognized or considered. Research on this topic would focus on incorporating studies of artifact movement and displacement into work being conducted by other environmental researchers.

BUDGET CONSIDERATIONS FOR HIGH PRIORITY RESEARCH ISSUES

Budget estimates are obviously quite tentative at this point because impacts research can be conducted in a variety of ways which may be integrated with other aspects of cultural resources research. The extent to which it may be desirable to coordinate such research will substantially affect the cost of conducting experimental studies.

General cost estimates for the high priority issues identified in this impacts research agenda are summarized in table 2.

SUMMARY

The research agenda outlined above proposes three major lines of management impacts research, and the topics within them that are considered to

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Table 2.--Impacts research costs.

Programmatic Issues:
- Secondary Impacts - ca. $200,000 per yr., 5+ years.
- Comprehensive Study Units Inv./Monitoring - ca. $200,000 per year, 15 years.
- Preservation/Avoidance Measures - ca. $100,000 per year, 2 years.

Functional Issues:
- Fire Management Impacts - ca. $75,000 per year, 2 years.
- Timber Management Impacts - ca. $100,000 per year, 5 years.
- Range Management Impacts - ca. $75,000 per year, 5 years.

Generic Issues:[1]
- Impacts of Soil Mixing
- Impacts of Trampling/Treading
- Erosional Impacts

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[1]Because of the general and multi-functional nature of the generic studies, they can be staged in a variety of ways with budgets ranging from minimal to large depending upon the complexity and length of time of experimentation.

have the highest priority for research. These issues focus on the major impacts which affect cultural resources. Research on them can provide comprehensive results to ensure that cultural resources receive appropriate management treatment.

As discussed at the Cultural Resources Research Symposium, management impacts research can be joined with a number of aspects of the research outlined in other work groups. Most closely related is that of the Protection/Preservation work group. The recommendations made by that group and those made by the Management Impacts group could quite effectively be consolidated into a generalized Cultural Resources Impacts Research framework which would include investigation of impacts to cultural resources from the public, from natural forces, and from management activities. The need for research dealing with cultural resources has been amply demonstrated. The next step is to determine how this research can best be structured and organized.

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United States Forest Service: Programmatic Issues Concerning Native Americans[1]

E. Charles Adams[2]

Abstract.--The USFS has interacted at the forest level with Native American groups for many years. Utilizing a questionnaire sent to forest archaeologists in the Southwest Region, this paper discusses the perceptions the USFS has toward Native Americans and suggests ways to alter patterns of past behavior, to rectify false impressions, and recommends programmatic changes to improve relations.

The United States Forest Service (USFS) and American Indian Tribes are both land managing entities, albiet the forest service more in a stewardship role whereas reservations are set aside for the use of specific groups. Often these lands are contiguous, sharing lengthy boundaries. In the western U.S. most Native American groups have had at least part of their original land base set aside on their reservation. This has played a significant role in their ability to maintain a cultural identity. It has also allowed Native Americans to retain a strong identity with their land base, their greatest resource, and to maintain ties with lands off the respective reservations, as well as on. Many of these traditional lands are now managed by the USFS. This has required the development of relations between the tribes and the forest service to effectively deal with potentially conflicting uses based in part in cultures having different value systems.

This paper explores the relationship of the USFS to Native Americans through the eyes of forest archaeologists, those individuals most frequently assigned the task of managing the forest's cultural resources by the forest supervisor. To assess the cultural resource manager's view of his or her forest's relations to Native American groups in touch with the forest, a questionnaire was sent to archaeologists from 11 forests in the Southwest Region. Nine responses were received and these form the bases to the characterizations accorded the forest service in this paper. Although the responses on the questionnaire may or may not accurately reflect forest service policy, the responses do reflect the perspective of those most directly involved with the day-to-day contact the forest has with Native American groups.

LEGAL ISSUES AND ACCESS

The USFS legal obligations to Native American groups are defined by a number of acts and USFS rules and regulations promulgated under these acts. The act most prominent with respect to Native American rights is the American Indian Religious Freedom Act of 1978 (AIRFA) and associated USFS rules and regulations. Secondary legislation includes ARPA (Archaeological Resources Protection Act of 1979), NEPA (National Environmental Policy Act of 1969), HPA (Historic Preservation Act of 1966), Rangeland Renewable Resources Planning Act, and associated rules and regulations, such as 36 CFR 800 and 36 CFR 219. These acts, rules, and regulations require the USFS to involve Native American groups in the planning process for the individual forests and requires the forest service to allow Native Americans access to forest service lands in pursuit of objects or resources essential to the practice of their religion, even into areas normally off-limits to the general public.

Beyond specific legislative mandates involving Indian tribes, Native Americans are allowed the same access to forest service lands as any other American. Although access is not specifically limited, as with other individuals or groups, a special use permit is required to collect any materials. For some forests there is no fee for this permit. Interestingly, although most forest service land would be, or would have been, part of some, or several, Native American groups' aboriginal lands, few are actively pursuing claims and seem satisfied with the access they are afforded to these lands. It is also possible that Native American groups generally do not acknowledge the authority of the forest service to control their removal of items from

[1] Paper presented at the Forest Service Cultural Resources Research Symposium, May 2-6, 1988, Grand Canyon, Arizona.

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forest service land and thus do not bother to obtain permits. It also may be that they fear the permit process and thus do not use forest service land due to the permit requirements. Neither instance is satisfactory to the forest service and makes management of their resources more difficult.

USFS - NATIVE AMERICAN CONTACTS AND RELATIONS

Results from the questionnaire suggest that cultural resource managers for the USFS believe their relations with Indian Tribes are satisfactory; however, close scrutiny of the questionnaires detects what may be an underlying cause for this feeling and that is the small amount of interaction that takes place between the manager/archaeologist and his/her Native American "constituents". By constituents is meant those Indian tribes that a forest either must contact to review research designs or planning documents as required under ARPA or those tribes that claim aboriginal use of some part of the forest. Generally, these two groups are the same, but occasionally a tribe is not legally required to be given the opportunity to review documents, but nevertheless may claim aboriginal use.

Although relations are characterized as satisfactory, there is a lot of frustration felt on the part of the cultural resource managers. This is due in part to tribes' general nonresponses to requests for comments or review of legislatively-mandated documents. With the exception of the request for use permits, which are initiated by the tribe or its members, all other contacts are initiated by the USFS. These contacts are infrequent, formal, and almost always legislatively mandated. Contacts are usually by letter, although forest archaeologists that view their programs as being most successful or satisfactory in terms of their relations with Native Americans also frequently have phone and personal contacts. Other than permits and mandated tribal reviews of research designs, contacts with Indian Tribes involve either minor disputes over boundaries and some resources, and questions of access or protection of properties on forest service land deemed significant by a particular tribal group. Such properties almost always involve sacred or religious areas still known to the tribe which may or may not be threatened. Although Indians are generally viewed as nonresponsive, because tribal governments seldom respond to requests made by letter, apparently no systematic attempts have been made to determine why. Poor relations, as with any issue of some dissatisfaction, are usually attributed to inadequate money, time, personnel, and low priority within the system, or a combination of some or all.

STAFF RECOMMENDATIONS

Several interesting recommendations for enhancing relations with Native Americans were voiced by the respondents. Two thought that changes should be made within the tribes because the USFS was not getting responses to their requests for comments. Although many tribal governments are inefficient, if not unresponsive to requests, it would seem that a more reasonable solution to the problem on nonresponse might be to evaluate USFS procedures rather than expect every tribe to change or improve theirs. In point of fact is might be a problem in the way the forest service requests comments, rather than what they request.

Other recommendations are more constructive. One suggestion is to include Native Americans more in forest service interpretation and planning activities. A second suggestion is to remove policy-making for Native Americans from the local forest to the regional office. Finally, it is suggested that relations with Native Americans be made less formal. Each of these recommendations belies a general sense of frustration on the part of the forest archaeologist in dealing with Native Americans and the seeking of a solution to improving these relations. The heart of the issue seems to be that more and better contact with local tribes is needed and should lead to more communication and, ultimately, to improved relations.

In general the problems, as detailed or hinted in the questionnaire, can be summarized as follows:

(1) The forests are generally doing a good job of fulfilling their legislatively-mandated contacts with Native Americans, but

(a) They are not seeking to do a better job, at least not systematically.

(b) They do not understand the Native American perspective on issues

(c) They do not have the resources to do a better job (perhaps this is an allocation problem)

Some forests, however, are doing more than others with respect to Native Americans and their results have been interesting. The improved results have been accomplished through more personal contacts with tribes or individuals and attempts to involve Native Americans in the planning process. These are the forests that are the most satisfied by their relations to Native Americans. The conclusion that must be drawn is that more effort can lead to better relations and better relations can lead to better results in Native American involvement in forest service management of cultural resources and other issues.

SOLUTIONS

Given the above discourse, what methods can be identified that might yield the best results given the recognized resource allocation problems within the forest service? First, the allocation of resources must be considered. Allocation is in part a matter of setting priorities. If Native Americans are to be more fully involved in

planning and interpretation, then effecting this involvement must be given a higher priority. The forest supervisor together with the forest archaeologist must establish where Native American input is not only mandated, but also desired. Once internal priorities are established, then external priorities must be established. What are the Native American concerns and what solutions are there to these concerns? Of course the forests have sought Native American input for the last several years. The problem is how to get the tribes to express these concerns. The lack of input by tribes does not mean they have none. It means that the forests have not found the means to encourage the tribes to express these concerns.

My experience with tribes is that they inherently distrust institutions (especially of the federal government), but respond quite positively to the individual approach. By this it is meant that within each forest it would be quite useful to establish a "liaison" to handle all Native American "issues", acting, more-or-less, as a clearinghouse. Just as important to establishing this liaison is giving this person authority. The liaison should have direct access to the forest supervisor and not be forever tangled in red tape when it comes to needing decisions or action. If the liaison is powerless, the tribes will soon realize that just another barrior has been erected and the results will be more damaging than healing. If an individual acting in this liaison role is seen as effective and can be easily accessed by local tribes, input from tribes should increase markedly.

The Native American liaison cannot be a passive agent waiting to respond to Native American needs or contacts. This individual must take an active role in making contacts and ferreting out concerns. Each tribal entity should be contacted and visited. The structure of each tribe is unique and should be learned and understood. Who are the key people to contact over religious issues, wood issues, water issues, permits? Who is the chairman and how is he or she accessed? Who handles cultural resources? Is there an environmental or cultural section? It may be useful to produce a brochure explaining the function of the liaison office that identifies who the officer is either within the brochure of with a business card. The brochure should be simple and to the point giving examples of what services the liaison provides to the tribe.

When the tribe is so large in size as to have contacts with more than one forest, such as the Navajo Tribe, liaison may best be handled from the regional office. Otherwise, the Navajos may get three or four versions of forest service policy.

Initial contacts should yield tangible results. Demonstrating that the "system" works will give the tribes confidence in the liaison and encourage them to seek that position again. If the person acting as liaison is to change, it is important that the replacement be personally introduced by the outgoing liaison to smooth the transfer.

Before investing forest resources in a liaison office and setting off on an unchartered course, it would be well to contact other forests and even other regions to find out what programs they have tried, what has failed and been successful, and why. Learning from others experiences should make the particular course chosen by the forest a more successful one.

By going directly to the tribes the USFS has in effect opened the lines of communication. (It should be kept in mind that a translator should be available or used by the forest service representative.) The forest service should be ready to listen and to visit the tribes, often the tribal council, in person. It is recommended that this contact be made by the liaison. This person, by virtue of their link directly to the forest supervisor, should be informed and involved in all matters before the forest involving Native Americans. Armed with this information the forest service liaison can clearly and simply outline the forest's priorities to the tribe, how they can affect the tribe, how the tribe can have input into the planning and development processes, and so on. In return the liaison should request the tribe's priorities (or have them make-up such a list) involving resources on or use of USFS land. By determining the priorities, needs, and problems of both sides, solutions can be discovered.

Native Americans have access to USFS lands equal to all Americans; however, Native Americans have special needs and concerns of access and use that can require special considerations or unique solutions to potential problems. By opening lines of communication the USFS will become aware of potential problems much sooner and have many more options avilable as solutions. Native American groups are not only users and consumers of forest service lands, they can potentially enhance the resources under USFS care. The enhancement process can be achieved through Native American identification of resources significant to their culture whether they be natural or cultural. Identification and interpretation of these resources can enhance everyone's understanding and appreciation of the resource and allow the USFS to adopt innovative and meaningful ways of protecting the resource. This can include Native American participation in the interpretation and protection process.

CONCLUSIONS

The USFS must take a more active role in its relationships with Native American groups. To improve relations it is essential to open the lines of communication. Before communication can be successful it is essential for the forest service to know in what areas Native American input is mandated and in what areas Native American input could enhance forest service planning and development. Information about the

latter can probably be improved by directly contacting tribes and obtaining information about specific needs and concerns. To facilitate opening and maintaining communication channels it is recommended that a "clearinghouse" of Native American involvment in forest service planning and management be developed within each forest and at the regional level. This clearinghouse will be the province of a Native American liaison officer who will have direct access to the forest supervisor, have access to all forest service actions or plans that may affect or interest Native American groups, and develop "personal" contacts with each tribe that has legal or other interests with the forest.

The purpose of the liaison is to open lines of communication between both parties, with both groups benefitting. Native Americans should benefit by having input into the planning, interpretation, and perhaps even management of resources under USFS control. The USFS should benefit by servicing a new sector of the local community, Native American people, and by being able to better manage its cultural resources through obtaining input from tribal groups.

This paper is presented as an idea paper intended to provoke comment and discussion. Suggestions to improve Native American - USFS relations are not panaceas or perhaps are not even practical within the USFS management system. It is incumbant, however, on the forest service to take the initiative in opening and expanding lines of communication with Native American groups. To act in a passive manner expecting tribal groups to work within the system established by the forest service is not only naive, it is poor management. Native Americans have much to offer forests in enhancing the identification, protection, and interpretation of cultural resources under USFS management. There is no time like the present to begin tapping this resource or to reevaluate programs already in place.

Acknowledgements.—I would like to extend my appreciation to those forest archaeologists from the Southwest Region who took the time to complete and comment on the four page questionnaire I sent them on Native American-USFS contacts and relations. Although the responses on these questionnaires have led to many of the conclusions drawn in this paper, the conclusions are my own and should not be construed as representing the views of the forest service or of forest service archaeologists. The comments did provide the main spark to the ideas presented in this paper and I willingly share recognition for such.

Forest Service and Native American Relationships: Considerations for Research[1]

Sonia Tamez[2]

INTRODUCTION

One of the announced purposes of this conference is to "identify and prioritize research needed to strengthen relationships with, and promote understanding and appreciation of, contemporary cultural groups that have links to the past."[3] This paper addresses the context in which such research can be formulated and conducted.

All sociocultural research is influenced by developments in laws, regulations, and land-use issues affecting the participants in the research effort. A lack of recognition and understanding of the sociopolitical context can lead to ineffective problem identification, hypothesis development, data gathering, analysis, and conclusions. Therefore, I want to discuss key events and forces that have shaped Forest Service/Native American relationships in the past, and identify major developments that will affect future relationships. I will also make recommendations regarding research topics, methodologies, and approaches to conducting research that are responsive to the sociopolitical context I will outline here. Throughout this paper, I will bring in examples from California to illustrate certain points.

PAST INFLUENCES ON FOREST SERVICE/NATIVE AMERICAN RELATIONSHIPS

The following discussion of agency policy is based on research conducted by Tamez and Laidlaw in an examination of Native American policy developed by the Forest Service (FS) and the Bureau of Land Management (BLM) in California.[4]

The management emphasis for the Forest Service is on the use of land and natural resources. Within California, Federally-administered lands comprise approximately 48% of the land base and contain most of the undeveloped lands in the state. The Forest Service administers 20 million acres; BLM administers 17 million acres.

The Forest Service has been identified with forestry and timber production, but is currently emphasizing developed recreation and fish and wildlife habitat improvement programs. The Forest Service permits and regulates many other uses and activities such as hydroelectric development and mineral exploration.

The consideration of Native American social and cultural values in Forest Service decision-making grew out of concerns regarding the effects of Forest uses on cultural resources. As the Nation's environmental conciousness and social awareness changed over the past two decades, the scope of Federal law was extended to protect not only natural resources, but also cultural resources. Agencies such as the Forest Service responded to legal requirements to assess the effects of federal actions upon cultural sites by developing Cultural Resource Management (CRM) programs.

Although the Forest Service has managed cultural resources for over fifteen years, its CRM program did not have, until recently, affirmative preservation and interpretation objectives. The Forest Service's CRM program as originally instituted was reactive - responding to projects and activities that might adversely affect cultural resources.

The nature of the Forest Service's CRM programs is critical to understanding the Forest Service's relationships with Native Americans because it is through the CRM program that Native American values were first considered in land management planning and program and project development. Although the National Environmental Policy Act (NEPA) of 1969 and the National Historic Preservation Act (NHPA) of 1966 referred to the cultural aspects of our heritage and intangible values, federal agencies interpreted the implementing regulations as applying to material culture - specifically archeological sites. Native American values usually were only identified when considering the significance of archeological sites, and this was only one element of the potential significance of

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[1] Paper presented at the Forest Service Cultural Resources Research Symposium (Grand Canyon, May 2 - 6, 1988).

[2] Sonia Tamez is Forest Planning Coordinator for the USDA Forest Service, Pacific Southwest Region, San Francisco, CA.

[3] Letter dated August 21, 1987 from David F. Jolly, USDA Forest Service, Southwestern Regional Office, Albuquerque, New Mexico, to conference participants and other interested parties (file designation 2360).

[4] Tamez, Sonia and Robert Laidlaw. 1988. The Multiple-Use Mission and Cultural Conservation. Paper presented at the Annual Meeting of the Society for California Archaeology, Redding, California.

archeological sites. Consequently, Native American concerns were isolated from other social group values and diluted when viewed in the context of archeological site significance. The Forest Service relationship with Native Americans was largely defined in terms of identifying and mitigating the effects of agency projects and activities on archeological sites.

A few years ago, Forest Service planning started responding to Native American concerns in an affirmative way. Agency projects and programs started to be defined, at least in part, in terms of meeting Native American community needs for protection of both natural and cultural resources. Cooperative agreements were made regarding exchange of information and sometimes of land. Special projects were initiated to promote resources important to Native American communities.

The change in Forest Service/Native American interaction actually had its origins in agency response to environmental legislation enacted during the 1960s, such as NEPA. Agencies were mandated to plan comprehensively and to involve the public more in decision-making. Agencies were also required to incorporate interdisciplinary perspectives in land management and project planning.

Traditional agency values and historical management emphases were challenged, and agencies like the Forest Service became more concerned with sociocultural values in an effort to anticipate and moderate the conflicts that accompanied planning.

Also during the sixties, there was a growing awareness of civil rights as a National issue. Civil Rights legislation mandated that federal agencies take the lead in ensuring that agencies actively support the civil rights of the Nation's citizenry, and consider the effects of agency programs and projects on the civil rights of agency clients and neighbors.

In the seventies, other legislation reinforced mainstream civil rights law and influenced agency relationships. The American Indian Religious Freedom Act (AIRFA) was passed in 1978. This Act established a national policy to protect and preserve the right of American Indians to exercise freely their traditional religions. This joint resolution also required agencies to evaluate their own policies and procedures as they affect the religious rights and cultural identity of Native Americans. This resolution reinforced the First Amendment rights to religious freedom.

To understand the impact of AIRFA, we need to go back to the First Amendment. It states:

> Congress shall make no law respecting the establishment of religion, or prohibiting the free exercise thereof, or abridging the freedom of speech or of the press; or the right of the people peaceably to assemble and to petition the Government for a redress of grievances.

The first clause is referred to as the Establishment Clause" and is the basis for the principle of separation of church and state in this country. The second clause is known as the "Free Exercise Clause" and is the basis for much of the litigation based on the First Amendment and AIRFA.

Benchmark First Amendment cases include the following:

Sherbert v. Verner (374 U.S. 389, 407 [1963])--The court ruled that the government must not indirectly burden religious practices.

Wisconsin v. Yoder (406 U.S. 205, 214 [1972])--The court ruled that a litigant making a free exercise claim must first prove that the state has burdened important religious interests. Once impairment is established, the state must demonstrate, in order to prevail, that there is an overriding public interest.

Both cases established that the government must do more than identify a public interest; the state must show that to accommodate the religious practice in question would specifically harm the public interest. The state must also demonstrate that no less-burdensome means is available to implement the policy.

AIRFA was intended to respond to charges that Federal Agencies were inadvertently impairing Native American religious freedom. In an effort to address these problems, AIRFA required Federal agencies to review their policies and procedures. If any of an agency's policies infringed on Indian religious freedom, it was to take appropriate action. Various recommendations for further legislative action were viewed during the Carter administration at the time, but subsequent law and rule-making were not forthcoming.

Despite AIRFA, a number of Supreme Court cases specifically arguing restrictions on Native American First Amendment rights followed:

Sequoyah v. TVA (Cherokee) 449 U.S. 953 (1980)

Badoni v. Higginson (Navajo) 452 U.S. 954 (1981)

Fools Crow v. Gullet (Cheyenne and Lakota) 785 D.S.D. (1982)

Inupiat Community v. United States (Inupiat) 182 D. Alaska (1982)

Wilson v. Block (Navajo and Hopi) 735 D.C. Cir (1983)

All of these cases resulted in the defeat of the Native American plaintiffs. These losses in the courts shifted efforts to statutory solutions. On March 31, 1988, Senator Cranston of California introduced a Bill, S. 2250, which would amend the

American Indian Religious Freedom Act (AIRFA) of 1979 in order to "ensure that Federal lands are managed in a manner that does not impair the exercise of traditional American religion." Section 3(a), the major provision of the bill, states that:

> Except in cases involving compelling governmental interests of the highest order, Federal lands that have been historically indispensable to a traditional American Indian religion shall not be managed in a manner that would seriously impair or interfere with the exercise or practice of such traditional American Indian religion.

Senator Cranston was joined by Senators Inouye and DeConcini. The bill went before the Senate Select Committee on Indian affairs, now chaired by Senator Inouye, on May 19, 1988.

S. 2250 is designed to reinforce AIRFA and, by extension, the First Amendment. Some agencies had expressed the opinion that in the absence of explicit statutory law directing them to do so, they could not manage lands and areas to protect Native American values without violating the Establishment Clause which requires a separation of Church and State. The bill is a response, in part, to that position and gives agencies legislative support for deciding to protect traditional sacred areas. The bill also goes beyond the review of policy into land management activities themselves.

S. 2250 has been given impetus by a recent Supreme Court ruling. On April 19, 1988, the Supreme Court ruled on Richard E. Lyng, Secretary of Agriculture, et al., Petitioners v. Northwest Indian Cemetery Protection Association et al., a case commonly known as the G-O road case. The court decided that the First Amendment's Free Exercise Clause does not forbid the Government from permitting timber harvesting in, or constructing a road through, portions of the Six Rivers and the Klamath National Forests that had been traditionally used for religious purposes by the Yurok, Karok, and Tolowa peoples.

Although the court found that there was nothing in the First Amendment that requires the federal government to preserve sacred sites, the court emphasized that the government needs to be sensitive to and consider Native American values. In the majority opinion report, Justice Sandra Day O'Connor wrote that:

> The Government's rights to the use of its own land, for example, need not and should not discourage it from accommodating religious practices like those engaged in by the Indian respondents.
>
> It is worth emphasizing, therefore, that the Government has taken various steps in this very case to minimize the impact that construction of the G-O Road will have on the Indian's religious activities.

Previous courts had established a three part test specifically for Native American religious use. This test was most eloquently articulated by Pamela Ann Rymer, U.S. District Judge (see Coastal Band of the Chumash Nation, et al. v. Ventura County, [1986]). Briefly the test questions are:

1. Is the religious practice central and indispensable?

2. Is there a governmental burden on the free exerciser?

3. Are there overriding public interests?

The court also ruled that the judiciary had no role in deciding centrality, but left it open to other institutions to assume the responsibility.

Regulatory institutions have been assuming some of that responsibility. The new implementing regulations of the NHPA (September 1986) emphasize public involvement and concern with sociocultural values by emphasizing the elicitation of community concerns, particularly among Native American tribes and groups. The criteria used to evaluate sites for the National Register of Historic Places have also been reinterpreted to include nominations of areas where the dominant values are sociocultural values.

Another development that might affect research directions is in the realm of natural resource management case law. The courts are going further in assessing cumulative and aggregate effects on natural resources, and starting to cross over into sociocultural effects. In a recent examination of ten major court opinions, Tamez identified four specific analogies that could be used to assess better the effects of agency activities on sociocultural groups.[5]

Research is needed to assist the Forest Service in responding to current trends in the courts, in the legislature, and in regulatory agencies. Ethnographic research is needed to identify traditional use areas and ways to minimize impacts. Research regarding contemporary use and values could assist in assessing the impacts of various project and land management options.

METHODS AND APPROACHES

The previous section dealt with potential topics for research. In this section, I want to focus on how research on Forest Service/Native American relationships should be conducted.

There is a danger of utilizing archeological paradigms for this research, arising from the

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[5]Tamez, Sonia. 1988. Cumulative Effects, Socio-Cultural Values and Land Management. MS in possession of the author.

close tie between the CRM program and archeology. We have to understand the epistemological underpinnings of both the archeological inventory and ethnographic study, and recognize the inappropriateness of using archeological paradigms to assess sociocultural values. As Laidlaw has noted:

> The value of important cultural materials to the archaeologist resides not only in the physical resources themselves but rather in the potential that these hold for answering significant research questions; these research questions and their theoretical context constitute the technical "world view" of the professional archaeologist. The value, then, of Cultural Resources for the archaeologist is largely assigned by the archaeological community. These assignments are dynamic and subject to change as the prevailing theories, methodologies, and analytical constructs of the discipline change.
>
> As is the case with all cultural groups, members of Native American traditional cultures have a world view that assigns the relative value and significances of features of the natural and cultural environment. Just as the world view of the archaeologist embodies basic epistemological tenets; so too does the Native American world view embody basic epistemology (Laidlaw 1987: 2).

As we recognize the legitimacy of paradigms outside of archeological ones for assessing sociocultural values, I anticipate that we will be adding ethnographers and social or cultural anthropologists to CRM and Planning staffs. We should also look at creating new partner ships outside the Forest Service - specifically, with the Native American communities who have traditional ties to the lands now managed by the Forest Service. I want to illustrate the possibilities with two examples from California.

The tie between California Native American communities and public lands has always been great. However, the changing land-use and ownership patterns in the state, and the changing priorities and needs of established reservations and rancherias, have contributed to a broader interest in resources and services provided by the Forest Service, as well as by other Federal land managers.[6]

Many communities are initiating a revitalization of traditional ceremonies that must take place in certain kinds of areas and that require certain natural resources. These practices are rooted in the past and, although suppressed for decades, have continued in some form. With the lifting of government sanctions on native religion, renewed traditional expression of cultural values is not only desired but deemed critical, in many cases, to the survival of the community.

For many groups, the sites and resources necessary for cultural maintenance are not available or accessible except on Forest Service, BLM, or National Park Service lands.[7] Private lands have been developed, resulting in damage or destruction of sacred areas. In many cases, unfortunately, private land owners have not felt a responsibility to make ceremonial status or critical resources that may be located on their lands available to Native Americans.

Reliance on sites and resources on public lands is the only option for many groups in their attempts to continue to exercise and express their religious values and beliefs. Public resources and lands are essential to cultural survival.

At the same time that Native Americans' reliance on public lands is increasing, other kinds of competing uses are also increasing. Recreation, energy, and other major capital investments and developments, and long-term allocations such as Wilderness designations, are increasingly "shrinking" the public land base. The need for planning prior to development and allocation, in order to reduce the potential for conflict between Native American use and other competing uses, has become more acute. The need for interagency coordination in order to facilitate Native American use of public lands has also become apparent. Native American community needs for certain kinds of resources perhaps could be met by a number of agencies working together. Although original, traditional areas are preferred, when they are altered so much that they aren't usable, substitutes can be sought. Areas that may have been secondary are becoming primary if they are now the only accessible areas.

In November 1986, the BLM, NPS, and the Forest Service met to identify the specific program elements that could be addressed by joining agency efforts. A standing interagency committee consisting of Roger Kelly, representing NPS; Robert Laidlaw, representing BLM; and myself, Sonia Tamez, representing the Forest Service, was established in February, 1987. Larry Meyers, Executive Secretary for the Native American Heritage Commission, represents the Commission and meets with the group.

This group is working on the following five issues and opportunities:

1. The need for consistent consultation policies.

2. The crisis regarding vandalism of Native American sites on public lands.

3. The integration of information regarding sensitive sites into land management planning.

4. The treatment, preservation, and protection of human burials and associated goods.

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[6] op. cit. (in note 4).

[7] op. cit. (in note 4).

5. The fostering of a better understanding among all federal agency personnel regarding the values, concerns, and rights of Native Americans who use public lands.

This institutional partnership is undertaking major policy changes in the agencies that manage over 40 million acres of lands traditionally used by Native Americans in California.

Another California example of a partnership, one that is more research-focused, is that of Helen McCarthy of Theodoratus and Associates and several members of the Sierra Miwok community. Archeologists had been working under the assumption that the depth of bedrock mortars in the region was due to the length of time they had been used in the processing of acorns. Ethnographic work with some of the Sierra Miwok revealed that the depth is correlated with intended function. Some bedrock mortars were specifically created shallow in order to process certain types of seeds while others were originally created deep in order to process other types of seeds, or utilized at various stages of seed processing. This information regarding material culture could not have been obtained without utilizing a paradigm different from the archeological paradigm, and is the result of a new partnership with the Native American community.

The importance of partnerships with the Native American community has been furthered by a landmark policy which will also have implications for research regarding Native American relationships. The long-awaited NPS Native American policy was issued last year. This policy concerns Native American use of National Parks for traditional and religious purposes. Key provisions include:

- extensive and intensive consultation with Native American groups of all age groups, men and women, traditional and political leaders, and religious practioners; and

- consideration of traditional values in decision-making regarding land uses, interpretation, and treatment of archeological sites.

The NPS policy has set the pace for other agencies. The Forest Service will be expected to follow suit. Implications for research include:

- the need for Native Americans to be working in partnership with the Forest Service to identify traditional values and to conduct other related research; and

- the need to utilize approaches that are different from those currently employed for understanding material culture. Specifically, contemporary Native Americans should be consulted regarding artifacts, features, and archeological sites.

SUMMARY AND CONCLUSIONS

We can expect competing uses of public lands to increase as the general public becomes more aware of public lands and as private lands become more developed. We will also see an increasingly active Native American community. Community interest in resource management decision-making will continue to grow.

All these developments point toward a consideration of cultural research for land management and project planning. The federal agency response is moving from a position where it has been focused on only the protection of material culture. Federal agencies such as the Forest Service are now concerned with how they affect cultural identity and the maintenance of cultural diversity.

For the past two decades, federal agencies have made a substantial commitment to the protection of archeological sites. CRM programs were developed to stimulate protection of material culture, and focused on the identification and treatment of archeological sites. Research is critically needed to shift the Forest Service emphasis from material culture to include sociocultural values, in order to respond to current trends in the courts and in the legislature, as well as in the communities the Forest Service serves.

The consideration of sociocultural values calls for a perspective different from that appropriate for material culture resources. The discussions above illustrate that this research requires a multi-disciplinary approach and a new partnership with Native American communities. The growing body of case law demands a legal perspective and suggests some topics for study. The civil rights associated with access to and use of culturally important natural and cultural resources must also be addressed.

Anthropological models and methodologies are essential in order to identify both resources and values. Consultation with Native Americans and the collection of basic ethnographic data are critical. And finally, but perhaps more importantly, we need to recognize the importance of Native Americans as partners in research regarding their relationship with the Forest Service.

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Modeling Solutions to Indian Needs Concerning Cultural and Natural Resources on Forest Service and Other Public Lands[1]

E. Charles Adams[2], Elizabeth Brandt[3], Edmund Ladd[4], Terrance Leonard[5], Peter J. Pilles, Jr.[6], and Sonia Tamez[7]

The goal of the Southwestern Region of the Forest Service, in its relationship with the many tribes of the Southwestern United States, should be to provide a coordinated inter-agency and tribal partnership to promote mutual understanding of, and participation in, the management of National Forests and other public lands.

As a multiple-use agency the Forest Service, besides considering the effects of its activities on "special interest groups" such as Indian Tribes, is also charged to provide opportunities for such groups to accommodate their needs and desires to use Forest resources, consistent with laws and regulations and the needs of other Forest users. Various Forests have provided for Indian needs, and have actively sought ways to improve relationships with Indian peoples. For example, hiring of Indians for fire-fighting crews is a long-standing tradition in the Forest Service; assistance has been offered and given to help tribes develop para-archeology programs and to conduct investigations and prosecutions of pothunting cases; timber is provided to groups such as the Hopi to construct and rebuild pueblos and kivas; and several Forests have initiated land exchanges to acquire private property on which shrines were known to be located so that they could be better protected as public land.

Despite these positive activities, Indian needs and concerns are not understood and are not being met by the Forest Service as well as the agency understands and meets the needs of other user groups. This lack of understanding is one factor that has resulted in lawsuits and conflicts related to such things as ski developments on

sacred mountains, mining activities, and access to special areas.

The Southwestern Region of the Forest Service is unique in several aspects of its relationship with Indians. First, few Forest Service regions have the number of tribal groups with such cultural stability and continuity as are found in the Southwest. Specifically, 39 Federally-recognized tribes have access to the 11 National Forests within the Southwestern Region. Today, these tribes are represented by a number of tribal organizations, as listed below.

Tribal Groups	National Forests of Tribal Interest
Arizona Tribes and Forests	
Hopi	Coconino, Kaibab, Apache-Sitgreaves, Prescott
Navajo	Coconino, Kaibab, Apache-Sitgreaves, Cibola, Santa Fe
Tonto Apache	Coconino, Prescott, Tonto
White Mountain Apache	Apache-Sitgreaves
Chiricahua Apache	Coronado
San Carlos Apache	Apache-Sitgreaves, Coronado
Havasupai	Kaibab, Coconino
Walapai	Kaibab, Coconino
Paiute	Kaibab, Coconino
Northwestern Yavapai	Prescott, Kaibab, Coconino
Southeastern Yavapai	Tonto
Pima	Tonto
Tohono O'otam (Papago)	Coronado
Yaqui	Coronado

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New Mexico Tribes and Forests

Zuni	Cibola, Apache-Sitgreaves, Coconino, Coronado
Laguna	Cibola
Acoma	Cibola
San Ildefonso	Santa Fe, Cibola
Santa Clara	Santa Fe, Cibola
San Juan	Santa Fe, Carson
Tesuque	Santa Fe
Pojoaque	Cibola, Santa Fe
Nambe	Cibola, Santa Fe
Zia	Cibola
Santo Domingo	Santa Fe
San Felipe	Santa Fe
Santa Ana	Cibola
Sandia	Carson, Santa Fe, Cibola, Lincoln
Picuris	Carson, Santa Fe
Taos	Carson, Santa Fe
Jemez	Santa Fe, Cibola
Isleta	Carson, Santa Fe, Cibola, Lincoln
Cochiti	Santa Fe
Mescalero Apache	Gila, Lincoln
Jicarilla Apache	Santa Fe
Navajo	Cibola, Santa Fe

Oklahoma Tribes and Forests

Cheyenne	Cibola

Second, many tribes continue to use all or part of one or more Forests as part of their cultural sustaining areas. Third, many tribes, in some cases confirmed by archeological research, have historic and prehistoric remains on lands managed by the U.S. Forest Service.

LEGAL MANDATES

The U.S. Forest Service is mandated to consult with Indians in the conduct of its management activities by a number of laws and regulations. The most prominent of these are:

- The American Indian Religious Freedom Act

- The National Environmental Policy Act

- The National Forest Management Act

- Forest and Rangeland Renewable Resources Protection Act and its implementing regulations, 36 CFR 219

- The Archaeological Resources Protection Act

- Protection of Historic Properties (36 CFR 800)

The Forest Service is required to consider the effects of its land management activities on Indian groups. However, there are no accepted or consistent process, standards, or guidelines for eliciting and incorporating Native American concerns in land management or project plans. Consultation and involvement of Indians, when solicited at all, is seldom brought in at the earliest possible planning stage, but often late in the process, when it is difficult to modify project plans to accommodate Indian needs and concerns. Because current approaches tend to be reactive, with few changes made to accommodate Indian concerns, negative attitudes, mistrust, and a lack of understanding characterize much of the relationship between Indians and the Forest Service.

Existing laws and regulations focus upon protection and evaluation of archeological resources, historic structures, and other physical remains that are over 50 years old. Consequently, other cultural resources of significance to Native Americans are often excluded from cultural resource consideration. In addition, non-material concerns, newly derived religious needs, and continuing needs for access to Forest lands and Forest products are overlooked. The requirement for documentation of an age greater than 50 years devised for historic sites overlooks gaps in the ethnographic record and the bias of the time when an ethnography was compiled.

Indian cultural areas, regions, and sites are in the greatest danger from adverse impacts to any cultural resources because their inherent cultural values, and even the existence of such areas, are largely unknown outside the Indian community. In addition, unlike some archeological sites, adverse effects to many areas of American Indian concern cannot be mitigated by documentation, excavation, or even avoidance. Indian concerns are not uniform, even within the same tribal group. There are concerns with archeological materials, land management practices, and resources on Forest lands.

Many Native Americans also desire interpretation that reflects individual tribal views on archeological sites and the cultural landscapes of which the Southwestern Forests are a part.

The concept and definition of cultural resource management must be broadened to include these cultural concerns and non-material remains if it is to provide for improved relations with Indian users of the Forests. Development of an improved process for involving Indians in the Forest Service planning process will increase management efficiency, reduce costs in project redesign, and reduce the chances of expensive litigation resulting from projects that affect Indian concerns. It would provide an opportunity to preserve and protect from project impacts the cultural sites and resources that might be overlooked by traditional survey techniques. Such a broadened perspective of cultural resource management could also provide for Indian interpretations of cultural ties with sites and land uses, enhancing our understanding of the Southwestern Forests as part of a cultural landscape.

PROBLEMS IN FOREST SERVICE-INDIAN RELATIONS

The broad concerns expressed above can be narrowed to specific problem-areas, which are as follows.

1. Indians do not know who to contact to express their interests in, and concerns for, Forest management activities. Efforts to solicit information and involvement of Indians in the project-planning process are inconsistent among Forests. Indian consultation in some Forests is done by the Forest Archeologist, and in others by Land Management Planners or the Civil Rights Staff. Conversely, Forests do not know how or who to contact to solicit information from tribal groups. For example, in an effort to cover all bases, some Forests send blanket "consultation" letters to groups and organizations that nominally represent many tribes. Information received from these groups may or may not reflect the actual concerns of the affected tribes, or specific groups within the tribes that may be most directly affected by the proposed project.

2. Past destruction of habitat has removed plant and animal species needed by Indians.

3. There is a lack of knowledge and understanding by Federal personnel of trust responsibilities, Indian treaty rights, and uses of Forest lands and resources by Indians. Such lack of understanding has recently been singled out by the Chief of the U.S. Forest Service's Civil Rights Task Force. It has led to such things as:

a. District personnel harassing Indians when they were collecting plants and minerals; and

b. Forests requiring Indians to obtain permits in order to collect natural materials.

Many Indian communities resent the control of any collecting of forest materials and products by the Forest Service, excepting endangered species, since many tribes have a strong conservation and stewardship ethic.

4. There are no consistent policies or procedures to safeguard the security of information concerning sacred places or traditional uses when such information has been provided to the Forest Service. Nor are there any policy statements protecting Forest Service Cultural Resource Management Specialists from divulging information they have received under promises to keep such information secret when the specialists are brought into litigation involving Indian concerns and Forest Service practices.

5. Tribes are seldom notified of Forest Service project plans and Forest Service personnel seldom know when their projects may affect Indian values and activities on Forest lands.

6. Privacy is needed at certain times by Indians when they are collecting materials or performing religious activities. Privacy is also needed when cultural resource specialists interview Indians or when Native people examine special areas within the Forests. Forest activities often take place in the same areas at the same time as Native activities. Better scheduling is needed to ensure privacy and avoid conflicts at such times.

7. Although all Forests have some ethnographic overviews, particularly the Cibola and Santa Fe National Forests, most are very incomplete and none is comprehensive. The quality of the information is normally drawn from old published sources and, due to the dynamic nature of Indian cultures, is outdated and inadequate for management or planning.

8. Reburial of human remains and associated artifacts is an emotion-charged issue to archeologists and Indians alike. Some tribes and Indian organizations assert that no excavations should be done. Others wish to have such studies to learn more about their past and to reaffirm their cultural identity. The impetus for such demands has largely come from Indian-rights groups and tribes outside the Southwest. Such issues must be addressed by the Forest Service, yet no research has been done with individual tribes to determine their attitudes on these matters.

RECOMMENDATIONS TO IMPROVE FOREST SERVICE-INDIAN RELATIONS

While many of the problems cited above will require long-term commitment to resolve, some immediate improvements can be made, as recommended in the following paragraphs.

1. The Forest Service should deal directly with individual tribes, and with those groups most directly affected by proposed activities. There are many groups and associations that represent or claim to represent Indian peoples, and it is often considered expedient to consult with them rather than try to identify specific tribal concerns. However, Forests should not consult with such groups to the exclusion of the individual tribes unless those tribes wish the Forests to do so.

2. As part of Forest land management planning, range allotment analysis, biological surveys, and timber stand compartment examinations, opportunities for habitat improvement for plants and animals needed by Indians should be identified.

3. Sensitivity training sessions should be conducted in each Forest Supervisor and District Ranger office to educate Forest Service personnel on the needs and legal rights of Indians to collect materials from Forest lands, and on the legal limits to such collecting. The job descriptions of Staff and Line Officers should be amended to include responsibilities for ensuring that Indian consultations are done for projects and activities in their area of authority.

4. Forests should consider abolishing individual permit requirements for Indians who wish to collect natural materials for personal, non-profit uses. Alternatively, consideration could also be given to issuing blocks of permits to tribal governments and allowing them to issue the permits to individual tribal members.

5. Until a national policy is produced, the Regional Forester should issue a supplement to the Forest Service Manual stating that it is Regional policy that information collected by the Forest Service from Native Americans about sacred places, sensitive collecting or use areas, and associated activities is respected and will be held in confidence. It is restricted for necessary uses by the Forest Service and the tribal source and will not be disseminated to other tribes, Indian groups, or other entities unless otherwise approved by tribal officials or the Native individuals concerned. Forest personnel are required to adhere to professional ethical codes when acquiring such information, and must promise to maintain its security.

6. Each Forest should appoint a liaison to coordinate Forest and tribal consultation, and should encourage the tribes it deals with to designate a liaison of their own (see below).

7. There is a need continually to consult with Indian tribes on a project-by-project basis. Interested persons should be consulted on Forest Service activities that will affect Indian resources or activities. Consultation should begin as early as possible and continue until the project has been completed, or dropped. Direct consultation is necessary even though other ethnographic information may be available, since existing information may not be complete or current, and project impacts must be considered in context. This is a dynamic partnership, with needs changing on both sides, and will lead to a reevaluation of the effects of specific impacts on resources. A process to develop a consultation process is proposed later in this document.

8. When particularly sensitive places have been identified, or certain activities requiring privacy are known to occur in certain areas of a Forest, consideration should be given to designating them as cultural resources management areas. Appropriate prescriptions should be developed for those areas to ensure proper protection of the material and non-material cultural values within them.

9. Forests must have base-line information on Indian uses of each Forest, and the concerns and attitudes of Indians toward activities allowed on Forest lands. The following section suggests the content of ethnographic overviews that can provide such information. The remaining problem areas described above cannot be adequately addressed until specific information about the attitudes of pertinent tribes to these problems is known. It is one function of the overviews to acquire this information.

DRAFT GUIDELINES FOR THE PREPARATION OF ETHNOGRAPHIC ACCOUNTS OF NATIVE AMERICAN USES, VALUES, AND VIEWS ON FOREST SERVICE ACTIVITIES

To address these and other Indian issues and concerns adequately, the following initial guidelines are recommended. They provide for the kind of ethnographic information and identification of cultural concerns that are relevant for planning and management. They should not be taken as exhaustive, and are subject to revision by individual Forests and tribes to reflect their own unique perspectives and situations. These Guidelines should be used to produce comprehensive ethnographic overviews for each Forest, and it is the consensus of the authors that the production of such overviews is the prime research need of the Southwestern Region of the Forest Service. Because such overviews are needed by all Federal agencies in the Southwest, it is suggested that the most efficient and cost-effective way of obtaining this information is to conduct and fund it as an interagency endeavor. Conducting such studies as a coordinated, interagency approach would also minimize impacts on individual tribes who would only have to provide such information once, rather than several different times to different agencies soliciting the same information.

As part of collecting this ethnographic information, a data base should be constructed of tribal uses and concerns. Obtaining such historical-use information will give Forests information that will be useful for resolving conflicting demands for access, use, or land claims, as well as to avoid or prepare for potential future lawsuits over such issues. This information should be coordinated and collected by the tribal groups themselves within these guidelines. The research need not and should not be restricted to these areas alone. This ethnographic and ethnological data base should be considered to be baseline documentation which provides initial information for use in Forest Service planning efforts. Recognizing that culture is dynamic, and that values change, this ethnographic data base should be frequently updated as part of Forest Service Land Management Planning reviews, or when a tribe requests that such an update be made.

We recommend the following guidelines:

1. Identify the relationship of each tribe or Indian group to the Forest(s).

2. Identify objectionable actions and practices in Forest Service land management.

3. Identify acceptable actions and practices in Forest Service land management.

4. Identify ways in which Native peoples use Forest Service land and resources:

a. Identify items collected, including species identification, if allowable by tribe, for:

1. plant materials, including timbers for construction needs;

2. birds and other animals; and

3. minerals.

b. Where allowable by tribe, identify different sites and areas used for the collection of these resources.

c. Where allowable by tribe, identify how factors such as access, availability, and condition of the resource to be collected influence the choice of these areas.

d. Identify seasonality and cyclicity of collection and use.

5. Identify the uniqueness and/or significance of the resource. For example, if the only source for a particular material is in a Forest, it would be of unique and irreplaceable value for a community.

6. Identify any need for privacy when using an area.

7. Identify any need for confidentiality of the information collected during the ethnographic study.

8. Identify any need for habitat maintenance and improvement or restoration of key species utilized by Indian people.

9. Identify sites or areas and their locations, if possible, that have significance because they are sacred or because of associations with historic (including oral-historic) or supernatural persons, events, or activities.

10. Determine if tribes can provide a "prioritized" list of sacred or other special places that are important for management to protect. Identification of significant areas should be a first-order priority for ethnographic studies. Such areas should be identified for management as soon as possible, and information about the locations of such areas should be kept confidential by the Forest Service.

11. Consult with each tribe to determine what kinds of information and issues they would and would not like to see presented in Forest Service interpretive projects on prehistory and modern Indian groups.

12. Determine what the tribes see as pertinent research issues and how these might relate to archeological and management-related Forest Service research issues.

13. Determine tribal attitudes and understanding of archeology. Specifically, identify the attitudes of tribal members toward site excavation, excavation and treatment of human remains, and reburial of human remains and artifacts.

TRIBAL PRODUCTION OF ETHNOGRAPHIES

For tribes that wish to participate in providing cultural information to the Forest Service and other Federal agencies, we recommend that individual tribes should be given the opportunity to conduct their own ethnographic research, since this is the best way to obtain current concerns and viewpoints. Tribes are in the best position both to identify and to access those people who have knowledge on sites, activities, and areas, and to represent their concerns about Forest Service land management activities.

These studies would not be total ethnographies, but would focus on the types of information suggested in the Draft Guidelines (above), and on other information relevant to particular tribal and cultural group concerns as they relate to National Forest or other participating agencies' lands.

Some tribes may have personnel who can conduct these studies, or they may wish to contract for the study. Forest Service Cultural Resources Specialists, or perhaps a Regional Ethnologist (see below), would have the responsibility of assisting tribes in designing, conducting, training for, or contracting for such studies, if desired. Forest Service funds should be available to tribes to conduct this research. Funds could also be available from other cooperating Federal agencies, such as the Bureau of Land Management, the National Park Service, and the State Historic Preservation Office. The latter office has certain funds to assist in the identification of significant cultural properties that may be appropriate as well. Normal research grants, such as those of the National Endowment for the Humanities, could also be pursued.

A PROPOSAL FOR COORDINATING INDIAN CONCERNS IN FOREST SERVICE PLANS

At the present time, the Southwestern Region of the U.S. Forest Service has a checkered and inconsistent program for obtaining information and comments from Indian groups relative to proposed Forest projects. Only four Forests (Cibola, Coconino, Kaibab, and Santa Fe) have developed programs to work with tribal groups. Only these four have regular communication with tribal groups regarding Forest Service projects and activities. Other Forests engage in dialogue with Indian groups when particularly sensitive or controversial projects arise.

There are several critical reasons for the lack of adequate information on Indian concerns and cultural sites. Major reasons are over-worked staff, lack of clarity on who has responsibility for the collection and curation of such data, and lack of effective continuing consultation with Indian tribes, organizations, and individuals. Mutual trust, understanding, and involvement of Native Americans can only occur when formal

procedures have been established that provide a mechanism for the effective exchange of information.

In order to address the problem at the management level, we propose a two-pronged program for developing working partnerships between tribes and the Forest Service: designation of Forest Service and tribal liaisons, and creating the position of Ethnologist in the Regional Office.

Each Forest Supervisor and Tribal Council, or Federally-recognized tribal authority, would designate responsibility for Forest Service-tribal relationships to one individual. Formal responsibility for consultation remains with the Forest Supervisor and the Federally-recognized tribal authority, although actual communication and action in this area is done through the delegated liaison. The Tribal Council or Federally-recognized tribal authority would determine whether or not the tribe chooses to participate in such a coordination program with the Forest Service. Should the tribe choose to participate, the tribal liaison would seek out concerns and interests of the various groups within the tribe and communicate these to the Forest Service liaison. When there is a change in tribal administration, or appointment of a new Forest Supervisor, each liaison will be approved for continuation or a new liaison appointed.

A major function of the liaisons is to provide an interface to promote effective communication between the Forest and the tribe. By having sufficient training and sensitivity, each can better explain the needs, desires, or problems of their constituencies. For example, the Forest liaison may be better able to explain the need and impacts of a timber sale to a Indian group than could the forester. Similarly, tribal concerns expressed to the Forest liaison by the tribal liaison could be better explained to Forest Service personnel by the Forest liaison. The Forest liaison could also communicate Indian rights to use Forest lands and resources, as well as treaty obligations, to field-level Forest Service personnel.

The use of liaisons has worked successfully and provides incentives for both the Forest Service and Indian groups to begin and maintain effective communication. It also fits into the organizational structure of the Forest Service and most tribal governmental structures, and meets the formal requirements of various laws, regulations, policies, and protocol procedures between agency and tribal officials.

Although simply appointing someone does not necessarily ensure that adequate consultation and communication will follow, there is a better chance for this than if no one has formal responsibility. Administrative assurance that the Forest Service and tribal liaisons provide useful communication and consultation is accomplished by requiring that liaison duties be part of the formal job description of each individual. A further assurance of success from the Forest Service side is that effectiveness of the program would be examined as part of the General Management Review process that all Forests undergo periodically by the Regional Office.

For the Forest Service, it would be ideal to have a professional ethnologist assume such functions on a full-time basis on each Forest. However, viewed pragmatically, this may not be a viable solution at the present time. Individual Forests need to decide where within their organization coordination with Indian tribes is best handled. Unique situations in individual Forests may result in coordination being best handled by different functional units. However, there are pros and cons to placing this responsibility in different units. It should ideally be placed in a unit that is familiar with all project activities proposed and on-going on a Forest at any given time. This is generally the Forest Supervisor, Deputy Forest Supervisor, Budget and Finance section, Land Management Planning section, and the Cultural Resources Management section, although other divisions, such as Public Information, could also be considered.

If conducted by the Supervisor or Deputy Forest Supervisor, contacts would be maintained at the level of administrative equals, that is, at the level of ultimate authority for each Forest and tribe. However, these individuals do not have the time to conduct such dialogue effectively. Although Budget and Finance sections are aware of projects funded for a particular year, they seldom know a project's current status and are usually not aware of future project planning. If the liaison is placed within the Land Management Planning section, Indians would be given the same status as other user groups that are routinely queried by planners as part of the project planning process. However, because of its involvement in ensuring that all on-going projects have cultural resources clearance, and in planning adequate funds and time for future projects, most Forests will likely find that this responsibility is best placed in the Cultural Resources Management section. There are several reasons why the liaison may be best located in the Cultural Resources Management section.

First, recent changes in the Southwestern Region's procedures for coordination of projects and consultation with the State Historic Preservation Office now require the Cultural Resources Management section to assemble a list of all projects planned each year on each Forest. The CRM section verifies the cultural resources clearance status of each project and submits the list to the SHPO for consultation regarding inventory levels and existence of known significant cultural properties, as required by 36 CFR 800.4. This list can also be sent to interested tribes both to inform them of proposed project plans and to solicit information regarding culturally sensitive areas or other concerns that can be addressed at the time the cultural resource survey of the project areas are performed. As

this master project list is revised in the CRM section, revisions can also be sent to interested tribes to keep them apprised of the status of each project.

Second, most people in Forest CRM sections have had some education, training, or experience in cultural anthropology and ethnology. This should give them some skills in effective communication with non-Anglo cultures, skills that are lacking in most other Forest Service personnel. Although the Civil Rights section has similar sensitivity, it generally does not have the knowledge of project status that the Cultural Resources Management section has.

Third, by locating such responsibilities in the CRM section, one of the current problems identified above - that "cultural resources" must be expanded to include more than prehistoric and historic archeological sites - is addressed.

Adams' study (this volume) identifies several problems hindering effective Forest Service-Indian communication. Specifically, tribes tend to distrust Federal agencies, and are often reluctant or unwilling to respond in writing to consultation requests. Once communications are personalized, distrust of the faceless bureaucracy will fade and higher response rates will be achieved, since each group knows who to contact when a potential problem or a need for consultation arises. When the Forest liaison suspects potential conflicts or concerns, informal consultation can be made with the tribal liaison to verify such concerns and arrange for meetings with appropriate tribal people. Discussions with them may result in compromises or solutions before, or perhaps without a need for, formal consultation correspondence between the Forest Supervisor and the duly elected tribal official. Conversely, when a tribe has a need for Forest resources or services, the tribal liaison can discuss such needs with the Forest liaison, who can make appropriate arrangements within the Forest Service organization to respond to such requests.

Consultations are best kept at a personal level, as suggested above, because tribes do not understand the Forest Service organizational structure or its distinction from other agencies. In a similar vein, few agencies understand the traditional or political organization of the various tribes. By developing personal contacts, these problems can be solved and considerable time saved.

REGIONAL OFFICE PROFESSIONAL ETHNOLOGIST

Although designation of a Forest liaison within the Cultural Resources Management section of each Forest has been found to be an efficient and effective method for communication and consultation, several weaknesses and inadequacies still remain. First, few Forest Archeologists or their staffs have the skills of a professional ethnologist. Consequently, Indian concerns may be diluted or subsumed by purely archeological matters and the archeologists may not be able professionally to handle issues involving major conflicts with Indians. Also, the professional competency and reputation of the Forest can be called into question when archeologists do ethnographic work without suitable training or experience. In addition, most CRM sections are one or more years behind in meeting timber sale targets and do not have the time that is needed to provide meaningful consultation, and in a timely-enough manner to benefit long-term planning. Such inadequacies can be minimized by adding the position of Regional Ethnologist to the staff of the Cultural Resources Management section of the Regional Office.

The duties of such a person would be to provide training to the Forest liaisons, and to prepare policy items for adoption within the Region regarding access to information, security of information, professional ethics when conducting ethnographic research, and the rights or limitations of Indians for privacy and use of National Forest lands. Additional duties of the Regional Ethnologist would be to design and conduct continuing ethnographic research in consultation with those tribes having interests on National Forest lands within the Southwest. In keeping with the service role of Regional Offices, the Regional Ethnologist would provide assistance to the Forests for situations that involved multi-tribal consultations or particularly sensitive issues the Forest liaisons are not able to handle alone.

The full scope of duties for a Regional Ethnologist would include the following:

- to provide training to the Forest liaisons, and the tribal liaisons, if they wish, in intercultural communication;

- to provide guidance to Forest Planning on ways to incorporate Indian concerns and values into the Forest and project-planning process;

- to play a proactive advocacy role in the Forest Service for Indian concerns;

- to review information provided by the tribes and Forest Liaisons;

- to provide integrated consultation and information on issues of interest or concern to all tribes;

- to serve as a clearinghouse for multi-tribal or multi-Forest concerns;

- to identify tribal interests with respect to Forest Service activities;

- to collect information and disseminate it to Forest and tribal liaisons as well as Forest Service management;

- to provide research services and coordination for individual Forests;

- to ensure legal protection of sensitive and confidential information collected and curated by tribal and Forest liaisons;

- to provide education, training, and leadership on ethical issues and the need for confidentiality of information and informants among Forest and tribal liaisons;

- to assist in General Management Reviews of the Indian consultation and involvement programs of the Forests; and

- to promote interagency communication and coordination in Indian-related issues.

SUMMARY

The key elements in the program suggested here for adoption by the Southwestern Region of the U.S. Forest Service are as follows:

1. Interaction with Indian groups should be kept at the most direct level possible. This will normally be between a Forest and a specific tribe.

2. Effective communication is the key to ensuring timely and appropriate consultation and relations with Indian tribes. Each Forest should designate one person to be responsible for communication and coordination with Indian groups, and tribes should be encouraged to designate a similar liaison as a contact person for consultation purposes. Experience has shown that personal contacts, rather than formal letters, work best to provide for the needs of the Forest Service as well as the tribes.

3. Each Forest should designate one person to be responsible for communication and coordination with Indian groups.

4. The position of Regional Ethnologist should be established within the Cultural Resources section of the Regional Office to guide policies, Forest liaisons, and ethnographic research.

5. Comprehensive ethnographies of Indian uses and concerns should be assembled for National Forest lands. Interagency cooperation and funding of ethnographic overviews should be explored since such information is needed by more than a single agency. The dynamic nature of Indian cultural growth and change needs to be recognized. Ethnographic overviews need to be updated periodically to reflect such changes, similar data kept current, and Forest management apprised of cultural changes.

6. Information about Indian uses and concerns should be considered at the earliest possible stage in project planning.

APPENDIX I:
STAFFING AND COST ESTIMATES

Alternative 1:
Regional Ethnologist and Forest Liaisons

Regional Office

1 Regional Office Ethnologist, GS-11	$30,000
20% indirect costs	6,000
	$36,000

Forest Supervisor's Office

Approx 1/12 of Liaison's time to perform liaison function

GS-11 x 11 Forests x $2500/year	$27,500

Tribal Ethnographies

39 tribes x $30,000 each	$1,170,000
20% indirect costs	234,000
	$1,404,000

Total One-time Cost:	$1,404,000
Total Annual Cost:	$ 63,500
TOTAL COST (first year)	$1,467,500

Alternative 2: Ethnologist on Each Forest

1 Regional Ethnologist (includes 20% indirect costs)	$36,000
11 Forest Ethnologists (includes 20% indirect costs)	$396,000
39 Tribal Ethnographies at $36,000 each (includes 20% indirect costs)	$1,404,000
Total One-time Cost:	$1,404,000
Total Annual Cost:	$ 432,000
TOTAL COST (first year)	$1,836,000

APPENDIX II:
RECOMMENDED ADDITIONS TO GS-193 PROFESSIONAL SERIES JOB DESCRIPTIONS FOR A REGIONAL FOREST SERVICE ETHNOLOGIST

1. Extensive training in ethnographic research methods.

2. Ability to train and supervise others in ethnographic research, data management, analysis, and the production of ethnographic reports.

3. At least two years of field work with at least two Indian communities in the Southwest.

4. A publication record that demonstrates familiarity with Southwestern Indian groups and ethnographic procedures.

5. A Ph.D. degree or suitable experience in sociocultural anthropology, including training in ethnohistory, history, and archeology.

6. Demonstrated ability to work amicably with Southwestern Indian communities.

APPENDIX III: PROPOSAL FOR NATIVE AMERICAN CONSULTATION RESEARCH

This research proposal has been prepared at the request of the Rocky Mountain Forest and Range Experiment Station to allow the Station to conduct research addressing the complex issue of improving communication between the Forest Service and Indian tribes in order to allow the Forest Service more effectively to manage all cultural resources on Forests in the Southwestern Region. The preparers of this research proposal do not believe this is the best way to develop an Indian-Forest Service program. As a result, the main document of which this appendix is a part has also been prepared. It outlines a program that we believe will be the most effective, cost-efficient, and productive course to increase tribal input into Forest Service management of Forest lands. This appendix should be read only in conjunction with the main document.

Mission

The purpose of the proposed research is to improve Forest Service management of cultural and other resources by obtaining timely, comprehensive, positive input from Native American groups.

Justification and Problem Selection

These are discussed at length in the main document, of which this appendix is a part.

Approach to Problem Solution

Three general problem-areas have been recognized that impede communication between Forest Service personnel and tribes, reducing the effectiveness of management decisions. Under each problem, several options are listed. It is recommended that each option be considered by gathering data to evaluate its effectiveness in providing information to managers or in reducing complaints by users. The data gathered by the research program should allow managers to choose which option is best. To facilitate the data gathering process, a sampling design of Forests and tribes is suggested for each problem.

Problem 1: Information about tribes is incomplete, inaccurate, and out-of-date.

The ethnographic portions of existing Forest Cultural Resources Overviews previously prepared by Forests must be reviewed by professional ethnologists, affected Indian groups, and professional archeologists. In order to make quick and accurate management decisions, it is necessary to have the most up-to-date, complete, and accurate information concerning all aspects of the potential impacts of management decisions. In the case of Indian uses, as well as Indian concerns for other activities on Forest lands, the existing information does not approach these standards.

The mechanism for obtaining information from tribes that will give managers the best data to make decisions must be determined. Three options should be considered:

1. Compile, summarize, and use existing ethnographies, ethnohistories, and historic documents. In some Forests this task may be subsumed under the Cultural Resources Overview(s).

2. In addition to item (1), conduct interviews of tribes by ethnographers.

3. In addition to item (1), contract to have tribes do their own ethnographies.

Test and define the best methods for obtaining the data from tribes regarding their uses of a Forest by evaluating the effectiveness of the programs on one Forest using four tribes.

Accomplishments Planned for the Next Five Years.

Year 1

1. Completion of peer and tribal review process for existing documents, including Cultural Resources Overviews of five forests.

2. Choose four tribes from selected Forests on which to conduct ethnographies.

a. Two tribes will do their own ethnographies and two will be studied by ethnographers.

b. The Cultural Resources Overviews will provide the framework for the ethnographies.

c. The studies should utilize the guidelines specified earlier in this document for the nature of the data collected by the ethnographic studies to ensure their utility to Forest Service management.

Year 2

1. Complete the ethnographies conducted by USFS and by tribal ethnographers.

Year 3

1. Conduct peer review of the ethnographies

2. Conduct USFS management evaluation of the ethnographies and syntheses.

Year 4

1. Test management recommendations as defined by the management syntheses.

Year 5

1. Test management recommendations

2. Evaluate the results.

Problem 2: Input addressing tribal concerns is solicited too late in the land management and project-planning process

Although the Forest Service has ten-year, five-year, three-year, and other planning cycles for management of resources, input on the impact of these management plans on Indians is almost never solicited until well into the planning process. At the present time, it is difficult to determine when Indian input can be most effective because project locations, size, and intensities become more specific as the planning process progresses. Is there a point where available information does or does not provide for adequate dialogue between the Forest Service and Indian tribes?

For most effective management, when is it best to get input on tribal concerns into the project development process? Options for the timing of tribal consultation include: (1) the initial planning stage only; (2) the planning refinement stage only; (3) the planning completion stage only; (4) the implementation stage only; or (5) at all stages. We propose to test the efficacy of these options on five Forests.

Accomplishments planned for the next five years

1. Incorporate and evaluate the efficacy of tribal input at each stage of the project planning process.

2. Test management recommendations based on each process.

Problem 3: Responsibility for coordinating Indian input and concerns is fragmented within the Forest Service, severely inhibiting the ability of managers to obtain meaningful input from Indian clients

Present Forest Service structure usually places responsibility for coordinating contacts with tribes within the Cultural Resources section under the direction of the Forest Archeologist. Generally, the Forest Archeologist lacks the skills, training, and time to coordinate effectively Indian issues generated either through legislative mandates, unsolicited tribal concerns, or planned Forest Service projects. It is necessary to determine the best mechanism for assigning responsibilities for Indian contact and to obtain input from tribes.

For this a new job duty - a Forest liaison to coordinate Indian concerns and contacts - will be tested on five Forests. Various ways of assigning liaison responsibilities will be tested in various units of the test Forests. These will include establishing the liaison (1) as a new Forest function at the Staff level; (2) as a new responsibility of a cultural resources specialist; (3) as a new position within the Cultural Resources section; (4) as a new responsibility of a land management planner; or (5) as a new position within Land Management Planning.

Accomplishments planned for the next five years

Year 1

1. Evaluate the effectiveness of existing Indian coordination program on each Forest.

Years 2 - 5

1. Compare the effectiveness of the five models to the existing program and to each other.

Staffing and Cost Estimates

It is assumed that the Research Station scientist who coordinates the research projects will be a GS-11 position (approximately $30,000 per year) assigned half-time to this program over a period of five years with a 20 percent support (overhead) cost.

Research Scientist, GS-11, 1/2 time	$15,000
20% support	$ 3,000
TOTAL	$18,000/year
TOTAL COST: $18,000/year for 5 years	$90,000

Problem 1

Basis of Cost Estimate

Review of existing Forest Cultural Resources Overviews:

35 days @ $200/day	$ 7,000

Ethnographies: contract at cost of $30,000 each with 20 percent support costs

$30,000 each x 4	$120,000
20% support	$24,000
TOTAL COST:	$144,000

Peer Review of Completed Ethnographies: contract at $3,000 each with 20 percent indirect costs

$3,000 each x 4	$12,000
20% indirect costs	$ 2,400
TOTAL COST:	$14,400

Forest Service review of ethnographies

Various personnel. Assume $12,000

Forest Service testing of recommendations

Various personnel. Assume $15,000/year

Forest Service evaluation of results

Various personnel. Assume $15,000/year

Annual Costs

Year 1: Review of Overviews	$ 7,000
Year 2: Contract for Ethnographies	$144,000
Year 3: Contract peer review of Ethnographies	$14,400
Forest Service review	$12,000
TOTAL (year 3)	$26,400
Year 4: Forest Service review	$15,000
Year 5: Forest Service review	$15,000
Forest Service evaluation	$15,000
TOTAL (year 5)	$30,000
TOTAL COST FOR PROBLEM 1	$222,400

Problem 2

The five test Forests receive $ 2,000/year to assemble and provide the necessary information.

5 Forests x $2,000/year x 5 years	$50,000
TOTAL COST FOR PROBLEM 2	$50,000

Problem 3

Basis of Cost Estimate

New Staff-level GS-12 Liaison	$36,000
20% indirect costs	$ 7,200
TOTAL	$43,200
Existing or new GS-11 Liaisons	$30,000
20% indirect costs	$ 6,000
TOTAL	$36,000

Forest Service review of effectiveness of existing Indian coordination programs. Various personnel. Assume $15,000

Annual Costs

Year 1: Evaluate existing programs	$15,000
Year 2: Implement and compare the models	$187,200
Year 3: Implement and compare the models	$187,200
Year 4: Implement and compare the models	$187,200
TOTAL COST FOR PROBLEM 3	$576,600

A summary of cost estimates for Projects 1, 2, and 3, by year, is given in Table 1.

Table 1.--Yearly cost estimates for research projects 1, 2, and 3.

	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Research Scientist	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 90,000
Problem 1	$ 7,000	$144,000	$ 26,400	$ 15,000	$ 30,000	$222,400
Problem 2	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 50,000
Problem 3	$ 15,000	$187,200	$187,200	$187,200	-	$576,600
TOTAL COSTS:	$ 50,000	$359,200	$241,600	$230,200	$ 58,000	$939,000

Areas and Issues in Future Research on Archaeological Resource Protection[1]

Martin E. McAllister[2]

Abstract.--The magnitude of the archaeological resource protection problem in the United States is briefly described and the lack of knowledge on the nature of this problem is discussed. Potential areas for future research on the problem are suggested, as are important research issues under each area.

INTRODUCTION

Most archaeologists recognize that a serious archaeological resource protection problem exists in the United States today. Even though nearly 10 years have elapsed since the passage of the Archaeological Resources Protection Act (ARPA), sites are still being looted and vandalized at an alarming rate on Federal lands and sites on state and private property continue to be targets as well. The magnitude of the current protection problem is only beginning to be quantified.

In the recent General Accounting Office (GAO) study entitled "Problems Protecting and Preserving Federal Archeological Resources" (1987), it was learned that an estimated 32 percent of the known sites on National Park Service, Bureau of Land Management and Forest Service lands in the Four Corners area of Arizona, New Mexico, Colorado and Utah were recorded as being disturbed by looting. In addition, another 33 percent of the known sites there are potentially affected by looting and vandalism since they are listed in the agencies' inventories as being in an unknown condition. Only 35 percent of the known sites are recorded as undisturbed and even many of these may have been damaged since they were inventoried or last inspected.

Also disconcerting were the GAO's findings on the frequency of looting and vandalism in the study area. According to the figures presented, documented incidents on lands of the three agencies in the Four Corners area totaled 1,222 between October 1, 1980 and March 31, 1986. This means that there were an average of approximately 222 reported incidents per year there or between 18 and 19 per month. The actual total figure for instances of looting and vandalism and the number per year and per month would, of course, be much higher if known.

Beyond the Four Corners states, documented violations involving archaeological looting and vandalism have occurred between 1979 and 1988 in at least 11 other states, Alaska, California, Oregon, Idaho, Wyoming, Minnesota, Arkansas, Illinois, Kentucky, Virginia and Florida, as well as in the District of Columbia. The most recent in California and Kentucky were particularly severe. In California, 19 individuals have been assessed civil penalties for looting at four submerged historic shipwrecks located in Channel Islands National Park and National Marine Sanctuary. The incident in Kentucky took place when 10 individuals leased a large prehistoric site on private property in which they dug approximately 400 holes disturbing between 1,000 and 1,200 burials. They have been indicted for violating a state statute which prohibits the desecration of graves. From information such as this, it can be concluded that the serious looting and vandalism problem documented by the

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[1] Paper presented at the symposium, Tools to manage the past: Research priorities for cultural resources management in the southwest. [Grand Canyon, Arizona, May 2-6, 1988.]

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GAO in the Southwest also continues to occur on a nationwide basis.

Despite some improvement in our knowledge of the extent, frequency and distribution of archaeological looting and vandalism in the United States, the position taken here is that we still know relatively little about the nature of the problem itself. There has been very limited analysis of the causes and characteristics of looting and vandalism and also neglected are formal evaluations of the effectiveness of current and potential solutions to the problem. The work which has occurred is inadequate relative to the scope of the situation which now exists. If we had analyzed the problem to the extent that we need to, then surely we could apply our findings to reduce the amount of looting and vandalism occurring.

The goal of this paper is to suggest areas and issues which appear to need further research and study in order for us to more fully understand why and how archaeological looting and vandalism occur and to develop effective and workable strategies for their prevention. Two categories will be addressed, the areas and issues which should form a background to the analysis and those which should be primary components of research on archaeological resource protection. The potential to actually carry out the research suggested from financial or other administrative standpoints will not be a concern here. The purpose is to identify what should be known from an ideal perspective.

BACKGROUND AREAS AND ISSUES

One serious shortcoming in the analysis of the archaeological resource protection problem which has occurred to date is that it has been carried out in a research vacuum. Archaeological looting and vandalism on public lands are types of illegal, anti-social behavior no different in their basic criminality than other forms of public property theft and defacement. Yet, we have tried to deal with them as if they were unique types of activities and not encompassed by the discipline of criminology. This situation can be rectified by reference to research on at least three areas in the study of crime. These are vandalism as a category of criminal behavior, the prevention of vandalism and general crime prevention.

Vandalism and Vandalism Prevention

Current research in these areas obviously should have a high degree of relevance to archaeological resource protection. Knowledge of this research would provide information on at least three important issues.

Willful acts of damage or defacement carried out for the intrinsic purpose of destroying archaeological resources are directly analogous to property vandalism of all types. It follows that what has been learned about the causes and characteristics of other forms of property vandalism should be a subject which will help to inform us about archaeological vandalism. For example, vandalism expert James Wise identifies proximity as one factor in this activity in situations parallel to those involving archaeological sites:

> In a recent survey of vandalism at outdoor recreation facilities, 80 percent of stolen or user-damaged items were within reach of 95 percent of passers-by (1982:34).

An issue which also should be considered is whether there are forms of vandalism involving theft that closely resemble archaeological looting. If there are, then what is known about these types of vandalism should be of definite interest in dealing with the looting problem.

The other major issue of concern is identification of the prevention methods which either are under study or are already being used effectively in combating the various types of vandalism, particularly any which have been found to be very similar to archaeological vandalism or looting. An example of such a strategy, limiting access to property as a means of preventing vandalism, has been described by Wise as follows:

> Easy targets are the most likely to be vandalized. In a park near Seattle, light fixtures that overhung a path were broken repeatedly. The path led to baseball diamond, and the glass globes were just within bat reach of exuberant, or dejected, players on their way home. Rotating the globes upwards 180 degrees put them out of reach, and stopped the breakage (1982:34).

Archaeologists have considered controlling access to archaeological sites

as a means of preventing looting and vandalism, but few if any studies have been carried out to determine if the strategy will actually work. By reference to the literature on current research on vandalism such questions can be answered, at least by analogy.

Crime Prevention

In the area of crime prevention there are several issues which should be addressed. As a starting point, there is a need for those concerned with archaeological resource protection to become familiar with the general theories of crime prevention under which the criminal justice system in the United States currently operates. The prevention of archaeological resource crime should be based on state-of-the-art knowledge in this area and not on outdated or unsupported theories. Since current approaches to the problem appear to derive primarily from what criminologists refer to as deterrence theory, critical concerns should be the concept and principles of this theory and the extent to which deterrence is currently accepted as an effective means of crime prevention. Also studied should be other conformity producing mechanisms supported by recent research in criminology and how they are seen to operate in relation to deterrence.

A brief introduction to the theory of crime prevention will illustrate the importance of the issues raised to archaeological resource protection. While not based on an exhaustive review of current research, the findings cited here should demonstrate the need for further knowledge of the work of criminologists.

Writing recently on the underpinnings of general and individual deterrence theory, three recognized experts on criminology, David P. Farrington, Lloyd E. Ohlin and James Q. Wilson, could have been describing the movement to enact ARPA:

> When the legislature wishes to raise the level of the publicly perceived moral culpability of an offense, it will frequently attach to its denunciation of the act a new option of imprisonment as a sanction or extend the maximum allowable sentence to prison . . . Use of the threat of confinement in this way is premised on the assumption that the social disgrace and deprivations of imprisonment have a powerful general deterrent effect on potential offenders. It is also assumed that the experience of imprisonment will help deter the individual offender from repeating his offense in order to escape further confinement (1986:135).

This might make it appear that the drafters of ARPA were on firm ground in the theory of crime prevention until it is learned that Farrington, Ohlin and Wilson go on to evaluate the current status of evidence supporting the deterrence model as follows:

> Considering the pervasiveness of these deterrent assumptions embedded in the criminal law, it is remarkable how little evidence can be assembled to document these assumed effects (1986:136).

One aspect of deterrence theory which does seem to be generally accepted according to Farrington, Ohlin and Wilson is the effect of certainty of enforcement:

> In general, . . . effective deterrence is linked to the public perception of the certainty of enforcement . . . Apparently an unenforced threat lacks the credibility to deter (1986:136).

Other criminologists also agree with this principle, as can be seen from W. William Minor's discussion contrasting the deterrent effect of certainty of enforcement or punishment with that of severity of sanction:

> The most consistent finding in deterrence research is that higher levels of certainty of punishment are associated with lower levels of crime. This pattern has been regularly reported in experimental studies . . . , in studies relating sanction structures to crime rates across different different jurisdictions . . . , and in studies relating individual perceptions of sanctions to self-reported criminality . . . The impact of severity of sanctions is much less clear, however. Various studies have found no apparent deterrence attributable to severity . . . , an apparent deterrent effect only for certain types of crimes . . . , or a deterrent effect of severity only at certain levels of certainty (1978:25).

Minor makes another important point concerning the deterrence model:

> With few exceptions, deterrence theory and research have been characterized by . . . a tendency to ignore conformity- and deviance-inducing devices other than deterrence (1978:29).

Minor sees deterrence as only one aspect of the larger "control theory" of crime prevention. According to his description of this theory, it distinguishes between conformity producing controls or sanctions which are "formal (i.e. legal) and officially administered" and those which are "informal and imposed by significant others (e.g. family or peers)" (1978:25), also referred to as "extralegal" sanctions (1978:30).

Criminologist Robert F. Meier also emphasizes the importance of alternatives to deterrence:

> . . . Legal threats are only one part of the overall web of social control efforts, and . . . the potential impact of legal threats cannot be appreciated fully without explicit consideration of this larger context (1978:223).
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> . . . They may not be as important controls as other (extralegal) influences . . . Even if research were able to identify fully the conditions under which legal threats deter, and if such conditions were changeable to maximize deterrence, the subsequent reduction in crime may be negligible if other factors remain unchanged (1978:235-236).

One informal, extralegal control considered by Meier involves risk perception as opposed to actual certainty of enforcement or punishment:

> A number of social control efforts have attempted to increase the perceived risk to potential deviants . . . The policy point is that if the primary goal of manipulating a control structure is to achieve a deterrent effect, one possible way to accomplish this goal is to lead the potential deviant to over-estimate the degree of control and risk in committing the act (1978:241).
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> . . . The goal is to manipulate the perception of potential offenders of the risk of deviance, rather than trying to change objective risk (1978:242).

More basic extralegal controls are the society's moral standards. In this regard, Farrington, Ohlin and Wilson point out that:

> . . . orderly society rests more securely on the internalization of moral standards and defenses against crime than on externally enforced sanctions (1986:136).

Another expert, Joan E. Jacoby, has elaborated on this point as follows:

> . . . Deterrence from criminal activity may be due more to the normative values of the community, church, school, peers, or economic institutions than to the punishment likely to be invoked by the criminal justice system. The power of social control relative to the controls of criminal law affects a wider population than does the imposition of criminal penalties (1978:139).

Concerning the effects of legal versus extralegal sanctions in crime prevention, Minor notes that:

> In studies which have directly compared these effects . . . , informal sanctions have been shown to be considerably more potent (1978:25).

It would appear, then, that the apparent failure of the more severe sanctions of ARPA to significantly deter looting and vandalism of archaeological sites could be at least partially attributed to the operation of two basic principles which have emerged from research on crime prevention. First, problematic aspects of ARPA, such as the $5,000 felony/misdemeanor distinction, have made certainty of enforcement of the law impossible so that its sanctions have not had the desired deterrent effect. Second, by assuming that a law with more severe sanctions would automatically solve the problem, deterrence has been emphasized at the expense of other extralegal controls.

Had the drafters of ARPA been more conversant with the work of criminologists on the theory of crime prevention, their emphasis on increasing the severity of the Antiquities Act's penalties might have been more prudently directed toward a concern for ensuring that the new act's prohibitions could be easily enforced. The same knowledge might also have led archaeologists and managers to devote more attention to extralegal approaches such as efforts to increase the risk perception of those engaged in looting and vandalizing archaeological sites and

programs designed to create or re-establish informal sanctions against the inherent immorality of these acts.

As familiarity is gained with the literature on criminology, we may need to consider whether there is a need for further revision of ARPA and current approaches to enforcement of the criminal provisions of the act. A working knowledge of the theory of crime prevention should certainly be acquired if the effectiveness of archaeological resource protection is to be enhanced in the future.

PRIMARY AREAS AND ISSUES

There are a number of factors directly associated with archaeological looting and vandalism which will require further research if we are to fully understand the nature of the archaeological resource protection problem. The primary research areas identified here are looting and vandalism behavior, the artifact trafficking network, public attitudes toward looting and vandalism, site risk factors, the extent and distribution of looting and vandalism, protection enforcement, protection training and site protection programs.

An obvious initial step in conducting future research in all of these areas would be to determine the current status of knowledge on each. As was pointed out earlier, little work has been done on the nature of the archaeological resource protection problem, however some studies do exist for certain of the areas listed. All of these studies should be identified, consulted and utilized to the extent possible in future research.

Looting and Vandalism Behavior

The behavior causing the archaeological resource protection problem must be understood if it is to be prevented. Working from this premise, a crucial research area will be determining why looting and vandalism behavior occurs.

A basic issue should be the identification of factors which motivate individuals who engage in either the looting or vandalism of archaeological resources. Several specific research questions can be suggested which would be pertinent to this topic. Is the concept of hobbyists inspired by personal interest versus commercial looters driven by the potential for profit valid as a basic distinction in the causes of archaeological looting? Are other motivating factors involved in looting? What provokes individuals who vandalize archaeological resources?

Following the isolation of basic causal factors should come further research to address the issue of identifying individuals or groups who are likely to engage in either the looting or vandalism of archaeological resources. Some specific research questions appropriate at this point would be the following. Can any distinctive socio-economic characteristics be associated with a proclivity for either looting or vandalism behavior? Are there any other identifiable individual or group characteristics which can be linked to either proclivity, such as sex and age? Is it possible to generate looting and vandalism profiles and, if so, at what geographic level, local, regional or national?

An additional issue related to the possibility of generating profiles beyond the local level is the existence of any significant regional variations in looting and vandalism behavior. Are there distinctive regional patterns of looting and vandalism behavior which deviate significantly from those in other areas? If so, are they different only in terms of the resources affected or do they diverge in other more important aspects of the behavioral patterns, such as basic motivating factors and the characteristics of those involved?

There should be a number of types of behavioral research which would address these issues and questions in the area of archaeological looting and vandalism behavior. If such research were to be carried out, experts on behavioral research in sociology would have to be involved to determine the best analytical methods to employ. Several potential directions can be suggested here. First, there should be systematic efforts to study individuals known to be looters or vandals. This would involve research on their backgrounds and interviewing if they would cooperate. Second, sociological survey research on motivational and demographic factors in archaeological looting and vandalism should be carried out targeting recreation users of public lands. Third, whenever possible, questions on archaeological looting and vandalism behavior should be included in other survey research projects.

The Artifact Trafficking Network

Also critical to archaeological resource protection is the larger context in which looting behavior occurs. At

present, it is known from law enforcement investigations that a regional and national trafficking network in artifacts exists. Its basic components are the artifact procurers, the hobbyists and the commercial looters, who provide the supply, the collectors who generate the demand and the dealers who are the middlemen.

Still to be analyzed is the more complex issue of the actual organizational structure of the network. A number of examples of specific concerns for future research can be listed. To what extent do artifacts originally procured by hobbyists find their way into commercial trafficking and in what ways? Do hobbyists become commercial looters and how frequently? Are the majority of commercial looters also collectors? What percentage of commercial looters earns the majority of their income by looting? How common is it for commercial looter to also act as dealers? What are the links between the local, regional and national components of the network that allow artifacts to move from where they are procured to higher level markets? What are the principal regional and national trafficking centers? How is domestic trafficking related to the international artifact market?

To answer organizational questions such as these, interview and survey research would have to be carried out targeting individuals who have knowledge of the various levels of the artifact trafficking network and how they interact. It is likely that the most important sources of information would be dealers operating out of regional and national trafficking centers. Difficulties which could be anticipated are a lack of cooperative informants on the overall structure of the network and resistance to revealing vital organizational details. The research proposed on looting behavior also should provide some insights on how individuals become involved in the larger trafficking network.

Public Attitudes Toward Looting and Vandalism

As was suggested earlier in considering crime prevention theory, a negative public attitude regarding archaeological looting and vandalism should be extremely important in preventing these acts. For this reason, definition of the current public attitude is a critical research area. Some criminologists argue for a basic perceptual distinction in the public or societal view of criminal behavior (Minor 1978). According to these experts, laws have greater deterrent power when they prohibit crimes regarded as "mala in se" or, in other words, inherently bad or immoral because they violate the society's moral code. Laws with less deterrent effect apply to crimes seen as "mala prohibita" or simply illegal but not immoral. From this standpoint, an initial research issue to be addressed would be how the public regards looting and vandalism of archaeological resources in terms of the two perceptual categories of criminal behavior. If it is found that these activities are viewed as simply illegal under ARPA and other laws and regulations, but not as inherently immoral transgressions of our moral code, then it would appear that prevention will be more difficult until this attitude is reversed.

Other specific attitudes of the public concerning archaeological looting and vandalism should also be an important research issue. Examples of pertinent research questions deriving from this issue are easily generated. Since Native American sites and artifacts are a principal target, what are the attitudes of the members of the various tribes and groups concerning looting and vandalism? Although it can be predicted that their outlook would be generally negative, it would be useful to know what specific views are prevalent. Does the majority of the public feel that looting and vandalism of archaeological sites should be illegal on Federal and state lands? Are there any circumstances under which they feel such activities should not be prohibited? What is the public attitude regarding appropriate levels of punishment for archaeological resource crime? How do they view looting and vandalism in relation to other types of crime? Obviously, the statistical weight of the specific public attitudes identified in relation to population size would be as critical as the attitudes themselves. Also important would be the recognition of any significant regional variations in public attitudes regarding archaeological looting and vandalism.

Formal sociological survey research should be carried out to further define the general public attitude toward archaeological looting and vandalism. Again, as with the survey research recommended on looting and vandalism behavior, it would be necessary to consult the experts in this field to design the best types of analytical approaches to data gathering and interpretation.

Site Risk Factors

This is an extremely important research area in designing effective prevention and enforcement programs for future archaeological resource protection. Unfortunately, it has been neglected since the early 1980's when a few regional studies of site risk were carried out.

The basic issue should be to determine what site characteristics and other associated factors increase susceptibility to looting and vandalism and, if so, the degree to which they affect risk. Based on past research, some variables which should be analyzed in relation to looting are: site type, site size, types of artifacts present, types of features present, presence, type and amount of previous unauthorized disturbance, type of physical access allowed to the site, presence and type of signs, presence and type of other physical protective measures, distance to trails, distance to roads, distance to private property and distance to towns. Any other factors which increase the risk of looting also should be identified, as should those causing greater susceptibility to vandalism. Regional variation in site risk proclivities also would be an important concern in future research.

A major research effort to address these issues would involve a number of important components. Each state should develop a site risk analysis system to identify and measure the factors which significantly increase susceptibility to looting and vandalism in that geographic area. Regional consistency in analysis systems would be highly desirable. Using existing site inventory records as the initial data base, studies should be conducted to identify all known looted and vandalized sites in each state. When the affected sites are identified, inventory information on them should be subjected to the risk analysis developed. Newly recorded sites in each state found to be looted or vandalized also should be analyzed as part of their accession into site inventory files. This ongoing analysis should result in refinement of the overall identification of site factors which increase risk. Each state should publish an annual report on the results of the site risk analysis conducted during the year. State results should be integrated regionally and nationally to determine what common factors in site risk exist at those levels.

Extent and Distribution of Looting and Vandalism

The lack of substantial knowledge in this research area is a serious handicap in our understanding of the full magnitude of the archaeological resource protection problem. For this reason, data gathering on the extent and distribution of looting and vandalism also should assume a high priority in future research efforts.

A basic issue which should be resolved in order for data gathering to proceed effectively would be to determine if the routinely utilized variables in the limited studies already conducted provide accurate extent and distribution assessments on a regional and national basis. In addition to locational information, these generally include total number of sites recorded, number and percentage of recorded sites which are looted or vandalized, number and percentage of recorded sites which are undisturbed, and number and percentage of recorded sites which are in an unknown condition.

It can be argued that assessments based on total numbers of sites in each gross category without some baseline discrimination of site characteristics do not reflect the true extent of disturbance affecting some site types. Some site related variables which could be considered for inclusion in these assessments might be identified as a result of the site risk analysis proposed above. Agreement on the relevant variables and how they are to be distinguished should be reached regionally and also nationally if possible.

Ideally, uniform data on the national extent and distribution of looting and vandalism should be gathered. One potential strategy to accomplish this end would be to develop a national form for documenting looting and vandalism of archaeological sites. The form should be brief, not exceeding one page in length, and should be utilized in conjunction with all agency and private institution inventory forms. It should be completed for all newly recorded sites which are disturbed and also for affected sites in existing inventories.

Created in conjunction with the documentation form should be a national computerized data bank for the information accumulated through the use of the form. The prototype for such a data bank

already exists in the Department of the Interior's Listing of Outlaw Treachery or "LOOT" clearinghouse maintained by their Archaeological Assistance Division in Washington. This computer data base is currently designed to accumulate information on cases involving prosecutions for archaeological violations, but perhaps it could be expanded to become the overall national data bank for documentation of site looting and vandalism.

Protection Enforcement

Reliable national statistics are also lacking in this area. If archaeological protection enforcement is to be improved, data should be available on the effectiveness of efforts which have occurred to date throughout the country. The two principal issues of interest would appear to be, first, statistics for cases in which charges were filed or citations were issued and, second, those for incidents where actual or potential violations were documented but no further action was taken. Included should be data for all agencies with responsibility for enforcing Federal, state, local and tribal laws or regulations which specifically protect archaeological resources or which have general prohibitions applicable to archaeological resources.

As part of the LOOT clearinghouse project, a case summary form has been developed. Categories of information requested on the form are: agency, region, state, location, defendant or defendants, incident date, arrest date, indictment date, information date, hearing date, trial date, plea and date, judgment and date, sentence and date, was there forfeiture and, if so, the amount in dollars or the items forfeited, fine imposed, contact name, telephone number, and narrative summary. Information gathering using this form, data analysis and dissemination of summary statistics to participating agencies are already in progress.

This research effort should continue and be expanded beyond the Federal agencies now contributing information to include all appropriate state, local and tribal agencies as well. The form should be used to record current and future cases involving charges or citations as well as all other documented violation incidents. In addition, the participating agencies should review their records to identify all past cases and incidents which have occurred in their jurisdictions. The logical date to use as a starting point for data gathering would be either 1906 or 1979. Beginning with the earlier date would be more difficult and pre-1970's data would often lack complete reliability. The advantage of attempting to include the older information would be to provide a baseline for evaluating the success of later enforcement. Once recorded in the LOOT clearinghouse format, the case and incident information should be submitted to the Archaeological Assistance Division data bank in Washington where it would be subjected to the already occurring data analysis and dissemination process.

Protection Training

This effort has received much attention as an approach to dealing with the looting and vandalism problem. Many law enforcement officers and archaeologists have attended 40 hour training programs on archaeological protection taught regionally by various Federal agencies since 1979 and by the Federal Law Enforcement Training Center (FLETC) on a nationwide basis since 1983. To date, however, there has been no formal, national research to evaluate the extent of this training or its effectiveness. Efforts to improve the availability and quality of archaeological protection training in the future should be based on such an assessment.

Basic information required in this research would be the number of law enforcement officers and archaeologists per agency who have completed FLETC's Archaeological Resource Protection Training Program or another equivalent Federal 40 hour training program. Since 1987, FLETC has offered a separate 16 to 20 hour block of instruction on archaeological protection as part of its Land Management Investigation Training Program, so the trainee figures for this or other similar Federal courses also should be obtained. Based on these numbers, the percentages of law enforcement officers and archaeologists per agency who have received training could be calculated.

Statistical measures of the effectiveness of the training would need to be designed also. Two relevant indices might be, first, the number of law enforcement officers and archaeologists per agency who feel they have prevented one or more archaeological violations since completing the training and, second, the corresponding totals for those who have subsequently been involved in the actual investigation of one or more cases. Also important would be the percentage of these investigations which have resulted in successful prosecutions. In addition, all participants in the programs could be

asked to provide written comments on the effectiveness of the training. To conduct this research, it would be necessary to obtain student identification information from FLETC for the Archaeological Resource Protection Training Programs and the Land Management Investigation Training Programs taught since 1983 and 1987 respectively. In addition, other Federal agencies should be requested to provide such information for any equivalent 40 hour or 16 to 20 hour training programs offered since 1979. A questionnaire also would have to be developed to acquire data and written comments to measure the success of the training.

Site Protection Programs

A number of programs of this type exist, ranging from minimal to intensive in the level of protection provided. They are managed by Federal, state, county and municipal government agencies, tribal groups and even amateur historical or archaeological societies and other private concerns in some instances. At present the details of some of the more sophisticated programs are generally known, at least on a regional basis, but there has been no systematic, nationwide study of site protection methods currently in use.

To address this issue, a national survey of existing protection programs should be conducted. Ideally, the research would seek to obtain basic information on all such programs throughout the United States, including location, site characteristics, protection features and length of time in operation. Also sought should be some appropriate indication of actual or estimated effectiveness in preventing looting and vandalism of the site or sites at each location. From the data gathered, there should be an attempt to produce an overall ranking of the protection methods currently employed in various situations, depending on factors such as the nature of the location and the number of sites involved.

Also needed is research designed to actually test the application of certain protection strategies. This could be carried out by monitoring their application to sample high risk sites in a geographic area while leaving other similar sites in the same area in an "as is" condition as a control. Tested in this fashion might be site signing, posting written closure orders on sites, physically restricting entrance, closing access roads or trails to sites, reducing the visibility of project management related site marking, removing all diagnostic and collectible artifacts from site surfaces, restoring all previously damaged areas, and patrolling by law enforcement officers on a regular basis. The use of many of these methods has been debated for years without attempting to determine if they actually achieve the desired protection effect.

There are also various experimental approaches to protection which should be more fully evaluated in the future. Examples of such programs are the complete excavation of high risk sites using volunteers as the field and laboratory labor force, the opening of archaeological laboratory and curation facilities to the public on a regular basis, temporary loans of display quality artifacts to individual members of the public under controlled conditions and sentencing convicted looters and vandals to work as laborers in stabilization and restoration activities or other archaeological projects. The prevention effect of experiments such as these could be evaluated by monitoring the condition of sites in the surrounding area during the time that the pilot program is implemented.

An additional issue, and perhaps the most important suggested here, is the use of public education as a direct site protection strategy. Vandalism experts are already conducting experiments on how various public education techniques can create what they refer to as "pro-social" behavior toward archaeological sites in order to prevent visitor damage (Chistensen in press; Gramaan et al. in press). More research of this type should occur to determine the range of educational activities that will function as informal, extralegal controls to achieve site protection and to evaluate their relative effectiveness in preventing looting and vandalism. Archaeologists should become more directly involved in this effort and contribute their expertise where needed. This will be an extremely significant issue in future research since public acceptance of responsibility for archaeological resources may well be the ultimate answer to the looting and vandalism problem.

CONCLUSIONS

An attempt has been made to identify some of the more important areas and issues for future research on the nature of the archaeological resource protection problem. Other critical concerns undoubtedly exist which have not been addressed here. As was stated earlier, the major

purpose has been to indicate how little we actually know about the problem at the present time.

There is reason for both optimism and pessimism in this regard. Some of the research suggested is already under way or could be carried out with relative ease and without excessive expense. On the other hand the national level research efforts proposed would require a great deal of time and money to accomplish. Whether they could be funded and carried out in the foreseeable future is highly questionable. Perhaps the logical compromise position would be to begin these projects at the regional level and postpone national integration until later.

Whatever approach is adopted, we can expect that efforts to substantially reduce the looting and vandalism of archaeological resources will be of limited effectiveness until further research is accomplished. The problem will not be solved until it is more completely understood.

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Cultural Resource Protection: a Predictive Framework for Identifying Site Vulnerability, Protection Priorities, and Effective Protection Strategies[1]

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Abstract.-- Research is proposed to develop and test a predictive framework which Federal land managers can apply in cultural resource protection. Information is needed on four critical factors: site characteristics, value differences toward cultural resource management, motivations for theft and defacement, and effective site protection strategies.

INTRODUCTION

Federal land managers have limited personnel and funds to accomplish many programs mandated by Congress, one of which is cultural resource protection. Thousands of cultural resource sites have been recorded on Federal lands in the Southwestern United States, and more are discovered daily. It has been estimated, for example, that only seven percent of the sites on Federal lands in the Four Corners area have been found and recorded (General Accounting Office 1987). Many of the recorded and unrecorded sites are targets for unauthorized disturbance, including the looting and theft of artifacts and other types of defacement, but only a few known sites have been protected through law enforcement activities or other measures (Downer in press; McAllister in press; Nickens et al. 1981; Waldbauer in press). The majority are unprotected.

The recent General Accounting Office (GAO) report (1987) was highly critical of all aspects of the Federal cultural resource protection program in the Four Corners region. The GAO found that approximately 43,848 cultural resource sites, or nearly one-third of those recorded on Federal lands in the area, have been damaged by theft or defacement to some degree. However, between 1980 and 1986, only 1,222 incidents of cultural resource theft or defacement were documented by the region's Federal land management agencies, and only 27 cases produced convictions under the Archaeological Resources Protection Act. These figures indicate that current protection strategies are not effective in combating cultural resource theft and defacement.

If cultural resource preservation was the only concern in Federal land management, it would be desirable to apply some form of protection against theft and defacement to all known sites. However, it is clear that available funding and other management goals will not permit full protection of all cultural resource sites on Federal lands. Agency land managers are increasingly faced with hard questions. What sites do we protect and how

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do we protect them effectively? It is critical that managers have some documented and supportable means by which they can assess relative protection priorities for known sites and reassess priorities as new sites are recorded.

PROPOSED RESEARCH

Frameworks have been developed to determine relative natural resource and ecological protection needs on public lands (Hoose 1981; United States Department of the Interior 1982). These frameworks have been modified by some Federal land managers to meet local cultural resource protection needs, but the thoroughness and effectiveness of the resulting criteria have not been formally evaluated, and remain in question for application beyond the level at which they were developed.

The goal here is to propose research to develop and test a framework specifically designed as a tool managers can apply to assess cultural resource vulnerability, prioritize sites for protection, and select effective protection strategies. The resulting evaluative criteria must be designed to rank site vulnerability on an ongoing basis and to assign higher protection priorities and the most effective protection strategies to the most vulnerable sites.

Overall management rankings of cultural resource sites will depend on a variety of factors such as importance to Native Americans, prehistoric and historic research values, and susceptibility to natural or management impacts (see the papers on these topics elsewhere in this volume). In order to develop a predictive framework for site protection, information is needed in four critical areas: site characteristics which affect vulnerability, value differences toward cultural resource management, motivations for theft and defacement, and evaluation of effective site-protection strategies.

The initial focus of the proposed research will be cultural resource sites managed by the USDA Forest Service in the agency's Southwestern Region (Arizona and New Mexico). At the same time, it will be desirable to develop a framework which is flexible enough in scope to allow future utilization by other Federal land management agencies in the Southwest.

Site Characteristics

Certain physical characteristics of cultural resource sites and their environmental settings have been found to be important attributes in overall vulnerability to theft and defacement in the southwestern United States (Downer in press; Nickens et al. 1981). Examples of variables of this type which have been utilized to analyze vulnerability are the following:

1. Site density, usually quantified as the number of sites per square mile or square kilometer.

2. Site visibility, in terms of the obviousness of physical features.

3. Site type, such as a village site with remains of houses versus a quarry and tool manufacturing site where only stone artifacts are present.

4. Types of artifacts present, for example, sites with decorated and undecorated pottery as opposed to those with only undecorated ceramics.

5. Types of features present, including items such as houses, storage facilities, ceremonial structures, and graves or burials.

6. Site accessibility, for example, distance to trails, roads, private property, and towns.

An analysis of vulnerability in relation to site characteristics such as these will be based on information on the condition of known sites in terms of the extent and nature of theft and defacement. Relevant categories of baseline information include the following:

1. Sites recorded as being disturbed by theft, defacement, or both.

2. Sites recorded as being undisturbed by these activities.

3. Sites which are in an unknown condition because information on theft and defacement was not recorded or is unclear or problematic.

4. The extent of theft, defacement, or both at disturbed sites, if quantified.

5. The type of theft or defacement activities evident, if specified.

The analysis must measure the degree of association between potentially significant site characteristics and site condition variables for those sites for which usable information is available. Site characteristics which are found to be strongly associated, either positively or negatively, with disturbance from theft or defacement will become important criteria in the framework for site protection. Continuing analysis of newly obtained site information can be used to further evaluate known associations and to measure relationships to variables not previously identified as significant.

The site data base for an analysis of this type may be derived from several sources. The computerized inventory for sites recorded on National Forest lands in the Southwestern Region is probably capable of providing much usable information. In addition, each Forest's physical inventory of site forms may contain additional relevant data not entered in the computerized system. All newly recorded sites in the Region also can be included in the data base as information on them becomes available. Finally, as the opportunity arises, previously recorded sites will need to be periodically reinspected to

document disturbance from theft or defacement not properly recorded initially, as well as any new damage from these activities. Eventually, sites recorded on other Federal lands in the Southwest also may become part of the data base.

Value Differences Toward Cultural Resources Management

Knowledge is needed that identifies agreements and disagreements in perceptions, values, and behaviors between users, nonusers, and managers toward cultural resources. The problem of value conflicts and lack of consensus is an important one and must involve the Forest user, nonuser, and Southwest cultural groups such as Native Americans (see the paper on Native Americans elsewhere in this volume). The nonuser is identified as a Southwest resident who does not use the Forests, but who may nonetheless value the preservation of cultural resources. Also, it is important to note that Southwest cultural resources have national significance and a sample of nonusers nationally may be necessary.

Protection issues are important, and the management and protection of cultural resources requires knowledge and understanding of behaviors, values, and perceptions. Most management and research have focused on single components such as discussions about archeological laws, the criminal justice system, or the network of commercial collecting. These evaluations and discussions are needed, but most of the problems in resource management are found in the areas of conflict -- or overlap (Clark et al. 1985). We know least about where the conflicts interact.

The rationale for this research is to develop new information that identifies areas of conflict in perceptions, values, and behaviors. The protection framework is based on an understanding of these conflicts and resolutions. The relative value of cultural resources emerges from the contexts of the various managers and cultural groups contacted. This information is analyzed for interrelationships and emerging factors are weighed for the predictive framework. For instance, the Federal land manager's responsibility in many agencies is to manage for multiple use; these managers are the designated stewards of our cultural heritage. The archeologist looks at cultural resources as a professional relationship. Law enforcement officers look at the enforcement of archeological laws as a professional duty but frequently have real conflicts with other enforcement priorities. The commercial collectors see looting as their legitimate right, while other types of collectors have similar rationales. The Native American looks at cultural resources with religious and spiritual values while wildlife organizations see cultural resources as secondary to wildlife values. Moreover, economic values of energy, industry, and land development often take precedence over preservation values. Congruence and lack of congruence between values are to be identified in order to develop guidelines for protection.

Information needed from managers (across Districts, Forests, and Regions), users, and nonusers includes:

1. The relative importance of cultural resource values versus other resource values (for instance, timber, range, recreation, wildlife, and water).

2. The perceived seriousness of the extent of theft and defacement.

3. Attitudes about selected management practices. For instance, an assessment needs to be made of the relative acceptability of selected practices or treatments in known cultural resource areas. These practices include:

   a. timber cutting
   b. fuelwood cutting
   c. grazing
   d. recreation uses
   e. chaining treatments
   g. water control devices
   h. range improvement
   i. stock tanks
   j. road construction
   k. oil and gas operation
   l. controlled burns
   m. wildland fire

4. The perceived effectiveness of protection strategies such as retrieving artifacts, offender sentencing by the courts, law enforcement efforts, and interpretation and education efforts to instill values about cultural resources.

One data collection approach is self-administered questionnaires given to randomly selected managers, users, and nonusers. Preliminary to this, it is suggested that exploratory, informal conversations be made with users and managers; this effort will identify key issues.

Motivations for Theft and Defacement

Causal factors need to be identified that explain why people conform or commit theft and defacement behaviors. The benefit of knowing why an individual or group comes to act illegally allows researchers and managers to develop and test prevention and control strategies for targeted groups. Motivation research also allows for the development of a profile of people (in conjunction with research on site vulnerability). Types of people potentially profiled include: (1) the commercial collector; (2) the intentional collector who loots for personal interest and possible material reward; (3) the recreational collector; and (4) the complier or person who is committed to the law and preservation values (Christensen in press). Theories from several disciplines have been offered to explain illegal behavior (Christensen 1978; Wilson and Herrnstein 1985), as have typologies of such behavior (Cohen 1973; Gramann et al. in press; Wade 1967). None of these perspectives has been tested with regard to theft and defacement of cultural resources. Some

typologies are based on acts (behaviors), actors (people), or motivations or reasons for action. A suggested approach to this research issue is to provide a rationale for the acceptance or rejection of previous typologies and develop revised or new paradigms relative to cultural resources. Possible respondents include violators, where participation is on a volunteer basis and information is treated confidentially. Oftentimes, violators are willing to respond to personal interviews or self-administered questionnaires and provide researchers and managers with valuable information. New information about perceptions of users and nonusers regarding the types of people who commit destructive behavior is also valuable. New knowledge about cause will be integrated with other factors in the development of a protection framework.

Site Protection Strategies

There are a number of protection strategies in use or potentially utilizable to prevent and control theft and defacement at cultural resource sites both on National Forest lands in the Southwestern Region and on other Federal lands in the Southwest. General categories of techniques now in use with some specific examples of each are listed:

1. Site Intervention

   a. Signing[6] (Dustin 1985; Johnson and Swearingen in press)
   b. Fencing
   c. Access control
   d. Anti-intrusion devices (including remote cameras)
   e. Less obvious project-related marking of sites
   f. Restoration or complete excavation of damaged sites

2. Public Involvement

   a. Prosocial behavior such as reporting violations by the public (Christensen and Clark 1983)
   b. Volunteer programs such as adopt-a-site and site stewardship (Pilles in press)
   c. Community programs (Pilles in press)

3. Public Education and Interpretation (Alderson et al. 1976; Sharpe 1976; Tilden 1957)

   a. On-site programs
   b. Outreach programs
   c. Volunteer excavations
   d. Media relations (including press coverage of successful law enforcement cases and undercover operations)
   e. Behavior modification programs (Gramann and Vander Stoep 1986)

4. Regulatory Controls

   a. Written orders and closures
   b. Action plan implementation
   c. Directing use through trail and road location
   d. Policy and regulation development
   e. Permittee compliance

5. Law Enforcement

   a. Investigations, citations, and arrests
   b. Informants
   c. Rewards
   d. Patrol techniques
   e. Specialized training

6. Legal Controls

   a. Alternative sentencing
   b. Selective acceptance of cases
   c. Court-imposed penalties
   d. Administrative settlements
   e. Forfeiture

7. Other Management Strategies

   a. Inter-agency communication and cooperation
   b. Action planning
   c. Modification of existing laws and regulations

At present, there is no general evaluation of the conditions under which each of these protection strategies will prevent or control theft and defacement at cultural resource sites in the Southwest. Analysis of their relative effectiveness will produce criteria which Federal land managers can apply to select the appropriate strategy or strategies to protect a site once its vulnerability and priority for protection are known.

SUMMARY AND CONCLUSIONS

The protection of cultural resource sites is a serious problem on National Forests and other Federal lands in the Southwest. Sites are being disturbed by theft and defacement at an alarming rate, and the majority are totally unprotected. Unfortunately, it is not possible to protect all currently known sites and the problem will increase in magnitude in the future as more sites are discovered. Faced with this situation, Federal land managers are asking which sites should receive priority for protection, and how most effectively to prevent or control theft and defacement at those sites. The research proposed here focuses on four factors in cultural resource protection: site characteristics, value differences toward cultural

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[6] Christensen Harriet H. and Daniel L. Dustin. 1986. "Reaching recreationists at different levels of human development: a review of Kohlberg and Gilligan," presented at the First National Symposium on Social Science in Resource Management, Corvallis, Oregon, May 12-16.

resource management, motivations for theft and defacement, and effective site-protection strategies. All of these must be analyzed to answer the questions managers are asking. The goal of this research is provide managers with a protection framework to assess site vulnerability, prioritize sites for protection, and select effective protection strategies. There is a critical need for this research in order to provide a sound basis for making difficult cultural resource protection decisions now and in the future.

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The Handwriting on the Wall: Prospective Preservation Research Strategies for the U.S. Forest Service[1]

Larry V. Nordby[2], Michael R. Taylor[3], and Judith G. Propper[4]

PHILOSOPHY AND ORIENTATION

Many papers at this symposium have emphasized that the Southwest contains what is probably the nation's richest, best preserved, and most complete record of human prehistory and history. This can be attributed not only to the density and diversity of cultural remains, but also to the fact that the Southwestern climate and environment have affected these remains less harshly than in most other parts of the country. To say that these resources are remarkably well-preserved, however, is not to imply they are unchanged or that they will last forever. Many cultural resources have been damaged or destroyed over the centuries by the natural forces of erosion and deterioration, as well as by human impacts; these processes continue. Because the record of the past is finite and non-renewable, such losses diminish our chances to study, understand, and interpret potentially critical parts of the story of past cultures.

Consequently, a program to stabilize, repair, and maintain the architectural residues from archeological and historic sites is an essential component of a proactive cultural resource management framework. The goals of such a program are to:

1. minimize the loss of important scientific information;

2. preserve for future generations examples of past technologies; and

3. enhance the interpretation and appreciation of past cultures by preserving places that convey a sense of past lifeways and the people who lived there.

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Such a program must seek to preserve the scientific and heritage values inherent in the original construction materials or "fabric," rather than focusing simply on manipulating or altering the fabric to prevent or inhibit further deterioration, a principle that is reflected in several recent preservation trends. One is the movement toward "softer" stabilization materials and a shorter-term maintenance cycle in order to maintain site integrity. Another is a preference for methods such as backfilling and drainage control, that preserve resource integrity without manipulating original architectural fabric. Increased emphasis on the role of careful, often intensive architectural documentation as a prelude to stabilization fabric work also reflects this attempt to preserve the attributes and values of architecture.

With over 20,000 cultural resources currently inventoried in the Southwestern Region, it clearly is not feasible to preserve or stabilize every property using traditional methods. National Forest managers are faced with difficult decisions about which sites to preserve using limited financial resources. At the present time, those decisions are being made on a highly subjective and opportunistic basis, in the absence of knowledge about the most critical stabilization needs, and outside of a programmatic framework.

The overriding preservation research need is to assess the status of the Region's cultural resources. Since archeological survey is generally the method used first to acquire information about sites, it is imperative that preservation information be obtained when surveys are undertaken. In such cases, data gathering on site condition, the nature and scope of deterioration, and how much standing architecture remains must be viewed as an important objective of the work. In tandem with the need to include preservation data during ongoing and future surveys, there is also a need to evaluate the quality of whatever preservation data already exist from past surveys. During assessment and evaluation, questions to be kept in mind include:

1. How many sites in the Region have architecture standing above grade, and how much of it is there at each site?

2. What is the condition of each site in the

Region, especially those with standing architecture?

3. Can resources be grouped into classes for preservation purposes? Which classes are in the greatest and most imminent danger?

4. What are the major sources of fabric deterioration and value loss?

5. How can we determine which sites should receive highest priority for stabilization work? What level of documentation is appropriate for sites where stabilization is inappropriate or unlikely?

Preservation data-acquisition using redesigned survey forms and upgraded site files is a critical first step in determining stabilization needs. This knowledge can be used to guide the development of carefully designed, specific research projects that ultimately will assist program managers and professional cultural resource specialists and technicians in making wise decisions. Three such research projects are listed in the following sections.

These projects focus on three lines of inquiry, all of which are necessary to preserve values inherent in historic and archeological architecture.

1. What must we understand about the fabric we want to preserve? This question subsumes studies about the physical and chemical properties of original materials, as well as potential stabilizing products.

2. What is the effectiveness of current techniques available to address critical stabilization problems? What new and more efficient techniques can be used to meet stabilization problems?

3. What construction techniques were used in the past? How can this knowledge aid in understanding and preserving the technologies and cultural values embodied in the sites we are trying to preserve?

Each of these areas is described as a project in the following discussion; however, each project is presented as a series of linked modules, each synonymous with a subproject. Modules are subdivided into phases, and normally each phase is roughly equivalent to a year's research work. Phases may be rearticulated either between modules or within a single module to form a single stage of the research project. This provides multiple-year continuity and also an intellectual link throughout any single research module. Furthermore, each phase for each module becomes a funding request unit or building block from which the overall project is built, as shown in figure 1.

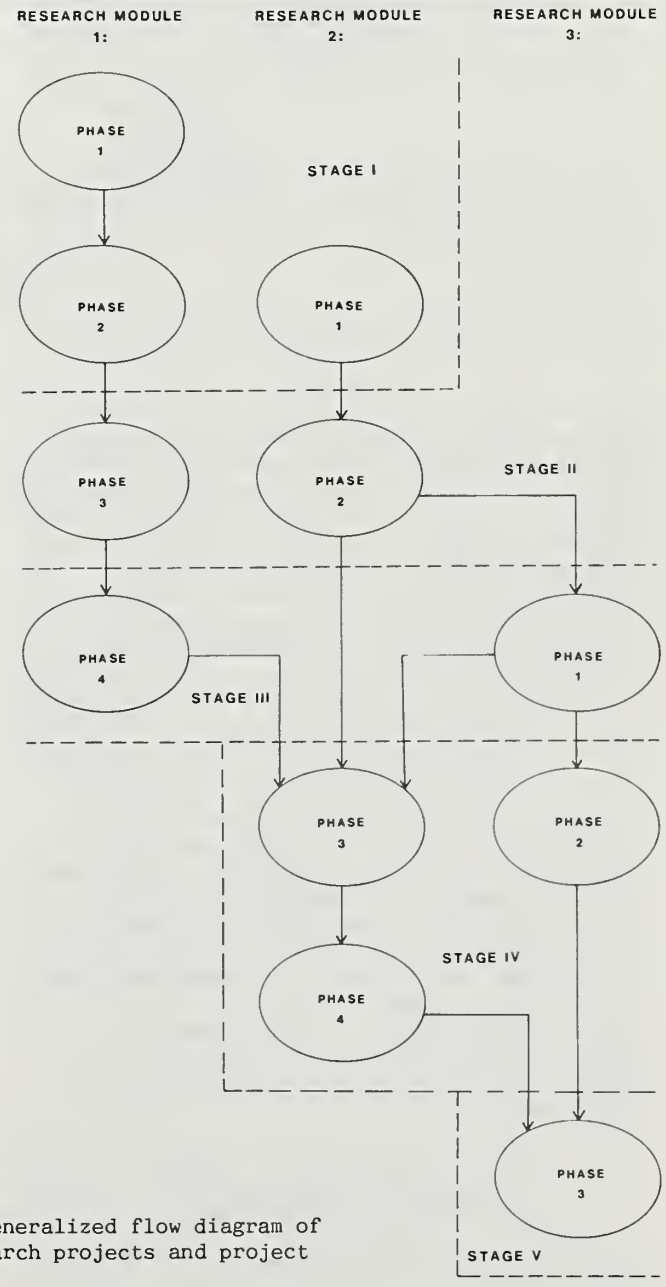

Figure 1.--Schematic generalized flow diagram of preservation research projects and project nomenclature.

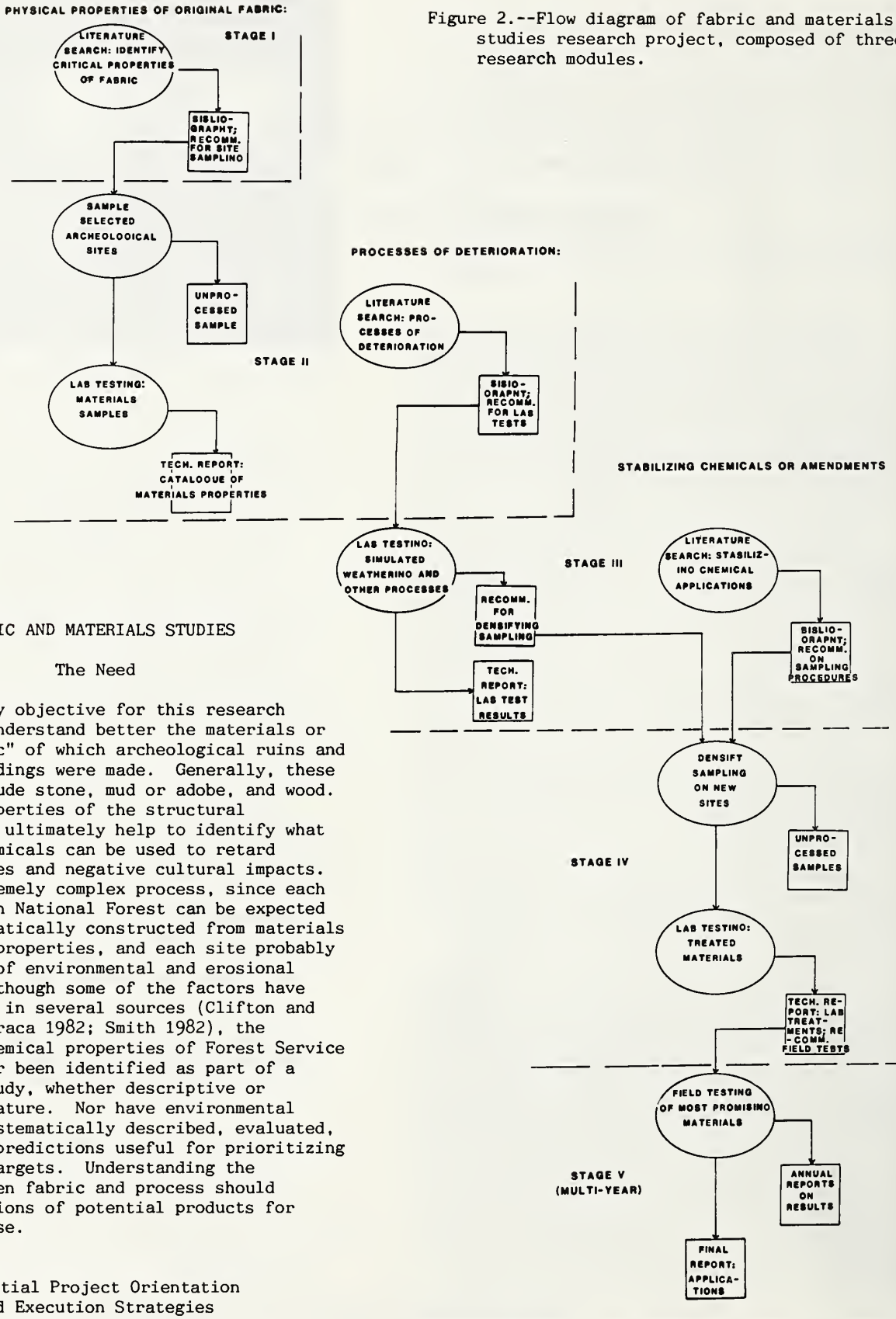

Figure 2.--Flow diagram of fabric and materials studies research project, composed of three research modules.

FABRIC AND MATERIALS STUDIES

The Need

The primary objective for this research project is to understand better the materials or original "fabric" of which archeological ruins and historical buildings were made. Generally, these components include stone, mud or adobe, and wood. Knowing the properties of the structural components will ultimately help to identify what stabilizing chemicals can be used to retard natural processes and negative cultural impacts. This is an extremely complex process, since each site within each National Forest can be expected to be idiosyncratically constructed from materials having diverse properties, and each site probably faces a number of environmental and erosional conditions. Although some of the factors have been considered in several sources (Clifton and Davis 1979; Torraca 1982; Smith 1982), the physical and chemical properties of Forest Service sites have never been identified as part of a programmatic study, whether descriptive or evaluative in nature. Nor have environmental factors been systematically described, evaluated, and applied to predictions useful for prioritizing stabilization targets. Understanding the interplay between fabric and process should precede evaluations of potential products for stabilization use.

Potential Project Orientation and Execution Strategies

This project is extremely complex, and is divided into the three modules shown in figure 2. The complex and interdependent nature of these studies requires that some project phases from different modules run concurrently as project

stages, but the general trend in module priority and organization is (1) determining the physical/chemical properties of original fabric; (2) research into the process of deterioration; and (3) a search for stabilizing materials. Outputs from various research phases are also shown as rectangles in the figure, with the phases themselves shown as ovals.

As is shown in figure 2, the first phase in each research module is a comprehensive literature search conducted in order to ascertain to what extent the topic has been dealt with previously by other agencies or organizations. Bibliographic searches can be done using a computer link that can access any building material conservation title in the extensive libraries of leading architectural conservation centers, such as the Getty Conservation Institute in California, the Association for Preservation Technology in Canada, and the International Centre for the Study of Preservation and the Restoration of Cultural Property in Rome. On the regional level, reports generated by the National Park Service, other federal, state, and local agencies, as well as institutions and individuals, constitute valuable sources. This literature search should be augmented by consultations with organizations currently studying the issue, in order to insure that (1) no research is being replicated; (2) there is maximal cross-fertilization between researchers and (3) gaps in the research are identified. The output for each literature search is a bibliography coupled with a set of recommendations that focus on sampling or laboratory testing procedures.

Returning to the modules, the first one activated should be research into the physical and chemical properties of original fabric: wood, stone, and adobe or earth. A number of studies that could be termed generic have already been done on this topic (Clifton and Brown 1978; Clifton and Davis 1979; Fenn and Chambers 1978; Torraca 1982). The interim objectives for such work have been to apply standard strength, porosity, and other tests developed for modern buildings, or to explore the ways that soil chemistry and such factors as particle size, clay mineralogy, and sand grain shape affect longevity. Nevertheless, the ultimate hope remains that better preservation will result from a broad spectrum of sample testing, in part because better knowledge of building material composition will aid in selecting soils that will produce more durable preservation mortars or bricks.

In terms of contributing to studies on sites of the Southwest, Forest Service properties have contributed little to data compilation, even though generic studies have some application to the Forest Service preservation effort. Identifying the physico-chemical properties of building materials will require laboratory study, processing, analysis and testing of samples collected in the field. If archeological work involves the exposure of walls with original fabric, samples should be collected and analyzed to create a catalogue of the physico-chemical attributes of both prehistoric and historic sites, not to mention fabric conservation (Price 1984). Supplemental strategies include sample collection from sites having standing walls as they are documented during survey, or revisitation of sites already in the data base with the same objective. In any event, sampling of the materials from sites will probably require some assessment of the scope and intensity of the sampling. Examination of the fabric of nineteenth century Euroamerican sites such as log cabins or board-and-batten buildings should also be included.

Once collected, specimens must be sent to a laboratory where a portion can be destructively analyzed, with the remainder preserved. Acquiring laboratory services is a common requirement for all three research modules, and requires a management decision as to how best to have data processed and analyzed. Since this is a complex issue, we'll return to it after discussing all three modules.

The outputs from this module are of several kinds. First are the preserved portions of samples from archeological sites, which can be used for future study or reference. The other two products are the catalogue of attributes, probably retained for in-house use by Forest Service preservationists, and some type of publication generated for the preservation community at large, as the reports of other agencies have been in the past. Information on the physico-chemical properties of building materials is then used to design the laboratory testing program for studying the processes of deterioration, the second research module in this project.

As with the first module, the second begins with a literature search into the processes of deterioration, which can be broken into two classes: natural processes, and impacts due to various human forces. The research program described in this module seeks to isolate the many variables of natural erosion, treating human factors separately. In reality, variables of both classes are inevitably interdependent, contributing to extreme project complexity.

Natural processes are numerous, and an exhaustive listing is not possible in a paper of this length. Abiotic processes are ongoing and constant, including moisture, wind erosion, and thermal shock caused by solar exposure, among others. Biotic processes relate to floral- and faunalturbations and negative architectural impacts.

For most sites, moisture is the main erosive culprit, but it arrives in many forms and stays active long after a passing thundershower deposits it. Examples of moisture-related problems include precipitation in the form of rain or snow, rising damp or capillary action from moisture entering at wall bases, and condensation within wall voids, material pores, and inside roofed structures. A compounding factor is differential soil loading,

which permits lateral groundwater movement, especially a difficulty when soluble salts are deposited on wall faces as the water evaporates. In some areas, freeze-thaw cycles accentuate the erosive condition.

The effects of wind and wind-born particles on historic structures is an area that has never been adequately examined by any study, although it is believed that abrasion from wind-driven sands can lead to the eventual failure of building systems under certain environmental conditions. Windbreaks comprised of native grasses or larger vegetation, and manufactured windscreens, have been recommended to reduce abrasion, but without supporting evidence.

Solar exposure, wall orientation, and consequent differential thermal expansion or contraction all detrimentally impact historic structures. Perhaps the most deleterious effect is from snow accumulation along the north side of a wall, where the freeze-thaw cycle is free to act using the natural expansion of ice. South wall faces comprised of paint and exposed wood change in appearance because of color changes induced by ultraviolet light, as well as from oxidation. Thermal shock occurs when a building's various components are suddenly and differentially heated by the sun because of the presence of shade trees.

Destructive biotic processes also relate to trees, wherein mechanical wall deformation follows the development of root networks. Because moisture retention is often better in locations where wall rocks shade the ground, trees may tend to grow along wall alignments. Once established, these trees drop organic material that effectively mulches the soil and accelerates the growth rate as well as root penetration. By-products of plant activity include the disturbance of stratigraphy and archeological deposits, and the disruption of surface runoff patterns. Chemical changes of original fabric from root proximity have not been examined.

Closely linked to floral impacts are those stemming from natural fauna. The most nefarious creatures are burrowing rodents, many of which enjoy the soft soils and high organic content of archeological sites. Dry rock shelters, overhangs, and caves containing ruins are safe from most moisture-related impacts, yet are often riddled with burrows and dens. Standing walls are often covered with rodent droppings, the chemicals of which may be corrosive, and plasters, mortars, and wooden elements are often destroyed by gnawing or digging. Insect or bird damage occurs on a less universal basis, but the scope of these impacts and ways of controlling fauna have not been thoroughly examined.

As if the litany of natural processes was not enough to complicate the research program, a second class of potential crises is paradoxically introduced by attempts to study and manage the resources and make them accessible to the public. Of these, increased visitation poses a set of problems that must be addressed. Visitors climbing on the walls, or simply walking through the site and developing pathways that alter drainage across it, are one source of damage. Differential loading is common for sites that are interpreted to the public. These problems have not been studied, nor have "visitations" by livestock which rub against standing buildings.

Research conducted as part of this module should also identify the potential deleterious effects of such actions as timbering, helicopter flights, blasting, and fire suppression. Each of these activities might produce vibrations that affect standing architecture, by rapidly alternating tensile and compressive stresses. The most susceptible elements are loose plasters, cracked masonry, and rubble cored walls. One study that the National Park Service conducted at Chaco Culture National Historical Park examined the effect of heavy trucks hauling road building materials near the ruins of Chacoan Great Houses (King and Algermissen 1985). The study concluded that sympathetic vibrations with negative impacts on the ruins resulted from the truck traffic, especially if located closer to the ruin walls, but also found that "detuning" walls was possible, using temporary emplacements that linked the wall with the ground. The application of this method to the timbering industry, especially for Euroamerican structures present in higher elevations, should be explored.

Fire, fire management, and fire suppression include dropping chemical suppressants from airplanes, controlled burns, water applications, and building fire lines. What are the impacts on historic structures? Clearly, wooden structures and elements such as beams in prehistoric ruins would be destroyed if fires occur. Cracking and spalling of stone and adobe elements are also likely. What temperature level is acceptable? Fire suppression activities have been described by the National Park Service's assessment of the La Mesa Fire at Bandelier National Monument (Traylor 1984), but no assessment of chemical alteration of masonry is included.

We have spent considerable ink describing some of the many things to consider as part of a program that studies deterioration, and these variables have been presented as subject matter for a comprehensive literature search. The output from the search should be a bibliography of sources, followed by a report containing recommendations for laboratory tests geared towards solving natural impact problems and for monitoring field situations generally related to human impacts.

The next phase in this module entails laboratory testing involving simulated and accelerated weathering processes, once again a laboratory procedure. An ancillary process is the gathering of statistics regarding visitor use or vehicular vibrations, probably by establishing monitoring stations in the field. Both phases would produce reports which link deteriorative

processes with the physico-chemical properties of materials to produce a sophisticated understanding of what is needed in preservation research, while setting the stage for the final module: the search for stabilizing chemicals or amendments.

In the recent past, a number of tests have been conducted on the viability of using chemicals to consolidate and retard the erosional rates of building materials such as stone, adobe, and wood. A few materials have proven positive, but most have not. Application of the proper stabilizer is dictated by original material, interpretive needs, significance of the property, the specifics of natural erosional processes, and cost. Most are considered in various studies that relate laboratory testing results, such as Sleater (1977). This kind of study constitutes the fodder for the literature search that initiates this module. The output for the first phase of this module is a bibliography of research into stabilization chemicals and a set of recommendations for ensuring that all structures needing stabilization help through amendments are considered, especially in light of the variable sets addressed by the first two modules.

No two sites are alike in material components and no two share identical environments. Sample densification may require prioritization or grouping of the most similar sites. What works as an amendment at one site may prove disastrous at another location. For example, one of the most successful chemical amendments is Rhoplex, generally part of the liquid component of a mud mix. A site that receives 8 inches of rainfall per year and has 160 frost-free days may require a Rhoplex-to-water ratio of 1:7, whereas a site receiving 14 inches of rainfall and only 100 frost-free days may require more of the chemical. Furthermore, some sites may require more than one mix for optimal performance in their different parts.

Selection of chemicals for laboratory testing proceeds from the literature search. These potential amendments are then subjected to various tests to screen out those that simply do not perform well. The products that survive the laboratory testing can then be run through a field testing routine that rearticulates all data from all modules. Specific field sites should be selected to monitor the effects of various destructive agents noted previously. Either existing sites or specially constructed ones can be used; however, it is recommended that at this point in the program a series of test walls, using a wide range of materials and amendments, be constructed at various locations in the Region where natural and human impacts occur.

The utility of such a program has already been demonstrated by several studies. For example, in an attempt to determine which chemical amendments to adobe mortar would be effective in retarding the cyclical maintenance needs of stone masonry walls required at Chaco Culture National Historical Park, the National Park Service developed a comprehensive field research project. It began in the 1970s and is still operational, with reporting ongoing. Positive results from this project have already been implemented at the Monument.

A more specific example of such research is the adobe test wall project at Fort Selden State Monument in southern New Mexico (Taylor 1988). The exposed historic adobe walls at the site are in constant need of maintenance. New Mexico State Monuments, Museum of New Mexico, embarked on a project in which 20 adobe test walls were built to experiment with chemically amended mortars and sprays, various foundation treatments to deter capillary rise, and capping techniques used to protect the tops of adobe walls. In 1987, the Getty Conservation Institute joined the adobe research at Fort Selden by constructing 30 new test walls in which various chemical infiltrations, shelter designs, drainage systems, backfilling techniques, and structural reinforcement systems are being tested (Agnew 1987). This cooperative effort between government and private non-profit concerns is the type of research needed to be cost beneficial for agencies such as the U.S. Forest Service. The Institute will have provided $180,000 in funds and matching contributions by the end of June 1989 to the Fort Selden research effort.

Project Products

It is important that the field testing program runs for several years. Often, secondary problems with chemical amendments occur later in the exposure cycle. One suitable example is color change following long-term exposure to ultraviolet light. Thus, the field testing program should generate a report for each year that it lasts. The ultimate output is a final report that identifies the best stabilizing amendments and matches them compatibly with original fabric and site-specific environments.

The basic organization for each module in this project is literature search, followed by laboratory testing or field monitoring, and field testing. As noted earlier, a major need is the acquisition of laboratory services for studying fabric, weathering processes, and stabilization materials. Establishing an architectural materials laboratory or contracting for services with an existing laboratory is essential to the success of this research program. It must deal with wood, adobe, and stone, and should handle plasters and paints as well. The lab should provide particle size analysis, mortar analysis, paint scheme reconstructions, and porosity tests (Teutonico 1987). A small architectural preservation laboratory could be set up for as little as $15,000, and providing the services in-house would ensure continuity, standardization, and responsiveness. Contracting for services may save costs but might inhibit testing continuity between modules.

RESEARCH INTO ALTERNATIVE PRESERVATION STRATEGIES

The Need

The integrity of the cultural resource base is crucial to maintaining the values represented in the masonry of individual ruins and in historic buildings of stone or wood, whether exposed by natural, archeological, or other processes. Stewardship of such sites implies that one is able to make informed decisions about the ways that this integrity will be best preserved by selecting from a list of preservation options. These alternative classes of strategies normally include: (1) direct fabric alteration methods such as repointing, resetting loose stones, filling embrasures with masonry, or capping the walls with more durable materials; (2) changing fabric environments through backfilling, constructing shelters, or attempting to control water movements by installing drainage systems; and (3) value preservation only through documentation.

Forest Service employees charged with preservation responsibilities must make decisions not only between strategy classes, but also within each class. Although there is literature describing the ways to shape and set stone in stabilization, the options stop short of preserving values, and often focus on the most expedient and efficient way to get the job done without much focus on replicating ancient or historical craftsmanship. There are no analytical or engineering studies on backfilling methods as they might be applied to archeological sites, and drainage system designs are based on nothing more than the intuitive feeling that water normally flows downward and assumes the path of least resistance. Documentation is a still evolving process, yet when to apply it in place of other classes of strategies, and what medium to use (photography, video-tape, or narrative/checklisted data, etc.) remain decisions that are made without a programmatic objective. A short exploratory foray into each class of strategies will help place this project into its proper context.

Potential Project Orientation and Execution Strategies

The techniques of Native American or pre-industrial Euroamerican building traditions encompass the range of individual actions that are appropriate for use during stabilization projects. Once materials that approximate the original ones as closely as possible given other managerial constraints are selected, they must be applied in such a way that surface finish and other attributes are compatible visually and in other ways with the original fabric. Such techniques as dry packing, dampproofing, surface tooling, newlaying, re-tempering, and controlled curing not only comprise the newly emerging lexicon of specialized stabilization terminology (Metzger, Eininger, and Gaunt 1988), but form the link between any material and the technical demands of installing it. The cost-benefit factors that accompany each technique are poorly understood, so the parameters that establish maximal material durability remain a mystery. Questions such as whether in any given case "newlaying" or "relaying" is more cost-effective or value-preserving remain unanswered.

As shown in figure 3, one research framework that attacks this problem identifies the complete spectrum of stabilization activities by reviewing stabilization reports and consulting stabilization personnel. Each action in this broad base must then be tested either using laboratory modeling or field testing. The field testing component is extremely important, and must be complex enough to examine various unamended mortars, soil-based mortars amended with a cross-section of chemical preservatives, and various soil-cement admixtures. Ideally, masonry styles involving various rock orientations and the viability and durability of wall caps should also be examined. Throughout the field tests, careful monitoring of material costs and time needed to use each technique are essential, so that the critical variables in executing a cost-conscious job that also preserves cultural values can be isolated.

A second component of this project consists of changing the environment of the fabric, generally through some form of terrain modification. For example, backfilling newly excavated ruins has been used for decades as a standard, intuitive preservation strategy, conducted almost as an afterthought to archeological field work. As stabilization budgets have diminished, its importance as a technique without any apparent future investment has grown. A traditional application was simply to recruit as large a labor force as possible using promises of liquid refreshment, pass out the shovels, position the recruits around the hole and shovel all the dirt that had been removed in the interests of science back into its place of origin in a cloud of sweat and dust. True sophistication was shown if some type of liner, such as polyethylene sheeting, was installed as a prelude to these energetic antics.

Since such liners may inhibit the exodus of moisture from site features under certain conditions, other materials have been introduced. These include filter fabrics and liners made of space-age materials; however, no data are available on which is best under any given set of circumstances. Another approach has been to line excavation floors with bentonitic clays or specially colored sands, either to demarcate maximum excavation depth or to control moisture movement. There are no quantifiable data to suggest that any of these techniques has positive, negative, or neutral impacts on preserving buried archeological features.

Finally, there is the question of composition of the backfill materials and the technique by which the feature is filled. Is the same material that came out of the excavation unit the best possible selection for replacement, or should

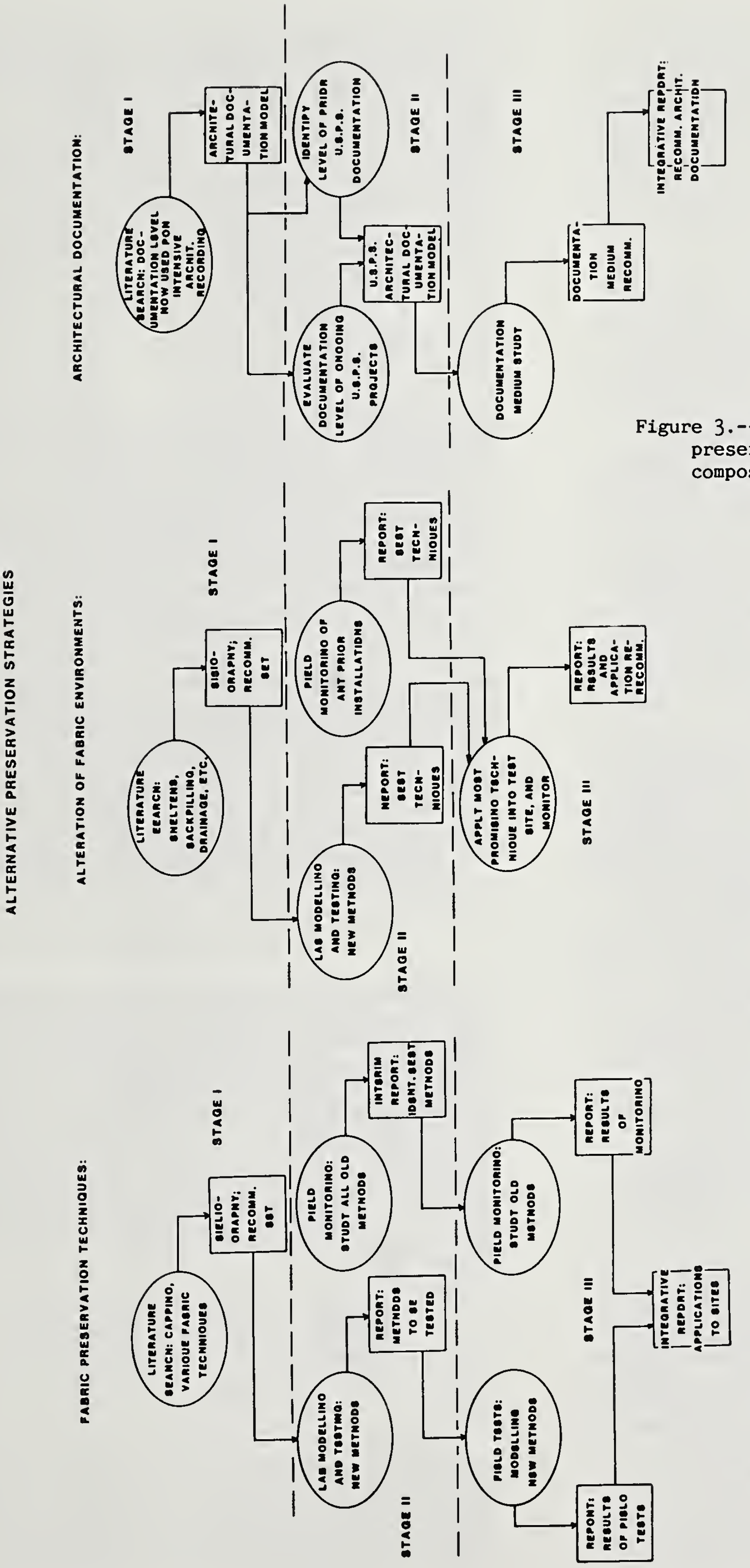

Figure 3.--Flow diagram of alternative preservation strategies research project, composed of three research modules.

materials with higher porosity and permeability such as sand or gravel be used? Would highly expansive clays be preferable? Regarding selecting a backfilling technique, the options generally either entail simple shoveling or compaction of the soil as it is being replaced in layers 10-15 cm. thick, using mechanical or hand-held tamping devices. Once again, no data exist that support either practice, or that indicate the likelihood of wall deformation or collapse under specific conditions.

Selection and design of appropriate drainage systems are issues closely related to backfilling, since installation may be enacted concurrently. Although in the past such devices as dry barrels and orangeburg pipe were installed as solutions to deterioration problems caused by surface water, the vagaries of maintenance programs and the absence of overall systemic design generally led to speedy obsolescence and ultimate abandonment. Nordby (1978, 1979) has installed several drainage systems at Aztec Ruins and Pecos National Monuments, and designed several others (Nordby 1984a, 1984b), yet the efficacy of such systems remains unquantified. Generally, the best system is considered to consist of two parts, a water collection subsystem and a water transport subsystem, functioning together in order to handle both surface and groundwater. No concrete facts support these assertions, however.

Another way of preserving sites through environmental manipulation is the use of shelters designed primarily to mitigate the impacts of precipitation. Of these, probably the best-known southwestern example is at Casa Grande National Monument, and the most recent applications are the Badger House shelters at Mesa Verde National Park. Although engineering and design factors have changed through time, generally shelter use is offered as a panacea for ruins with earthen-walled or adobe construction, when other stabilization methods are believed or demonstrated to be inadequate. Nevertheless, the inadequacy of other methods generally has been based on subjective assessments of adequacy, not of quantified research that takes many environmental and materials variables into consideration. Because the visual impact of a shelter is generally the greatest of any stabilization method and the resultant structure may itself end up competing for maintenance dollars, many observers deplore them.

Finally, the use of cappings has been evaluated by Taylor (1987). Generally of more durable materials than the walls they surmount, cappings almost always affect the appearance of the site. A cap design that encourages runoff and discourages the tread of unauthorized visitors' feet often is visually unappealing. It is important not only to identify the best design from several alternatives, but also to weigh the cap's effectiveness in terms of potential architectural value preservation.

The basic framework for research on this topic is identical to that which was discussed previously: compilation of literature on system designs and backfilling options, and consultation with stabilization practitioners. Engineering firms specializing in this type of work can then model various techniques in the laboratory or conduct field tests where either backfilling or drain installation have been attempted. In some cases, new testing may be warranted in order to control variables from the beginning of the testing program. Selection of sample sites could focus on individual sites or National Forests, and must also consider precipitation patterns. The results of laboratory modeling and field testing should identify the parameters that lead toward informed selection of techniques for modifying site environments.

The final research module in this project seeks answers to questions about architectural documentation, a practice that normally accompanies all stabilization projects. In this case, however, management is compelled by circumstances such as insufficient resource availability to adopt a policy of benign neglect or abandonment of individual walls or sites. This places a site into a salvage mode, where fabric loss is either imminent or will inevitably occur because the site's values are deemed less than those of other sites. Rather than simply allow such sites to degrade without further attention, a procedure must be developed to document selected architectural attributes and annex these records into the Forest Service data base. This is a procedure that does not necessarily entail research beyond that of surveying the literature, investigating alternative documentation strategies, and deciding the level of, and medium for, documentation. Knowledge of when to apply the method should also stem from the study.

Project Products

The component modules of this research must distribute project results as an integral element. This essentially consists of a report that describes the results of fabric alteration, site environment changes, and documentation studies. This kind of report would probably have a limited appeal that centers on the stabilization and preservation audience. It is a technical document that gives application guidance for technicians, preservation project supervisors, and program directors. Nevertheless, the report should have a wide enough distribution to extend beyond in-house practitioners.

RESEARCH INTO SOUTHWESTERN NATIVE AND EUROAMERICAN BUILDING TECHNIQUES

The Need

A programmatic commitment to fabric preservation strategies such as stabilization requires that techniques such as repointing and resetting loose stones at least be compatible with practices traditionally used by vernacular masons of the past. Toward this end, it is essential

that preservation craftspersons confronted with the broad spectrum of masonry styles and construction techniques found at Forest Service sites be conversant with what is known about such practices. Unfortunately, with few exceptions (Hawley 1938; Roys 1936; Dean 1969; Nordby 1980; Morenon 1977; Wilcox and Schenk 1977; Wilcox and Sternberg 1981), Southwesternists have expended neither time nor effort pursuing detailed documentation and interpretation of prehistoric masonry attributes other than wall abutments, electing to focus instead upon the similarly additive technology of ceramic manufacture.

The arrival of Spanish and Anglo populations in the Southwest introduced new kinds of structures while it concurrently altered the forms in which Native American materials were used. The ascendancy of logs, sawn lumber, and adobe bricks as building materials was tied to the use of metal tools and hardware, each contributing distinctive construction or use marks to the material. Novel techniques included wider, more massive walls and buttressing, splayed doorways and windows, and other features related to the use of larger buildings such as missions. Often, such edifices were built by Native American masons, working under Euroamerican direction.

Excluding a scatter of recent architectural studies produced in concert with stabilization documentation efforts (Beal 1986; Caperton 1975), little archeological literature is available to use as a training guide. Other potential sources of information might include courses given at university schools of architecture or the replicative studies that occasionally contribute to the study of prehistoric industries, such as the technology of chipped stone tool production. However, we are not aware of any such opportunity except ones in which vernacular Euroamerican architecture is studied.

Thus, the prospective stabilization project director and his assistants face their projects without any technical guidance beyond that which is derived from the modern-day stonemason armed with steel trowels and rock hammers. Although it might prove inappropriate or even disastrous from the cost-benefit viewpoint to abandon these relative conveniences, a need still exists to understand the behavioral processes by which the primary aboriginal or early Euroamerican building materials of earth, stone, and wood were transformed into dwellings or other architectural forms. We propose architectural research that is behavioral and processual in orientation, and thus contributes to archeology and anthropology, but only as a secondary, fortunate byproduct of a more essential and pragmatic need: to comprehend better the values inherent in previously exposed and newly excavated ruins and to apply this knowledge to an improved training regimen.

Potential Project Orientation

The Southwest is characterized by an often bewildering array of architectural forms. In the Native American tradition alone there are unlined pithouses; structures of vertical slabs; single-stone, double-stone or veneer/rubble-cored masonry; rammed earth, jacal, coursed adobe, mud-ball or turtleback structures; and post-houses, to list a few. Further diversity comes from the myriad of smaller interior features that were dug into or built atop the floor or added to the roofs, walls, or entryways. The range of features and building types expanded dramatically after the arrival of Euroamericans. What is really known about the dynamics of building these features? What were the task groups or organizational units that built walls, rooms, roomblocks, or entire villages? How were building stones quarried, shaped, dressed, set, and plastered?

The answers to these questions can be elicited using a research program that incorporates (1) archeological inferences based on architectural attributes; (2) historical and ethnographic synthesis and analogy; and (3) replicative experiment, among other means (figure 4). Although the rudiments of such research could be carried out within the framework of other site-specific archeological studies, the intensive focus on architectural data suggests that it is likely to fall beyond the normal allocations of time and money, and thus might best be considered as part of a separate architectural research package. The synthesis of available ethnographic data from Native American architectural traditions might begin with classic early architectural studies such as Mindeleff (1891), and proceed to evaluate observations about construction technique and residence patterns made at specific pueblos by such ethnographers as White (1962), Titiev (1944), Bunzel (1932), Beaglehole (1937), and Parsons (1925). Coupled with a program of oral tradition elicited from ethnographic informants, this process might contribute to prehistoric task and residence group recognition in addition to a better understanding of building practices. Although we suspect that there is less ethnographic information within the Euroamerican tradition, the same overall orientation applies, with the focus of the research on historic documentation.

Replicative experiment extends this concept to an analysis of modern craftspersons building domiciliary and other constructs using aboriginal or historical tools and methods. Such a process would provide comparative data on how long it takes to build walls using selected methods such as single stone or veneer/rubble-cored masonry. In turn, the results might contribute to assessments of caloric requirements per cubic feet of wall construction, and ultimately to work force estimates such as the one proposed by Lekson (1984: Appendix B) for Chaco Canyon Great Houses (which itself should be tested).

The architectural research proposed above links archeology, ethnography, and replicative activities, and could adopt any one of several conceptual frameworks. One potentially fruitful avenue might encompass the application of

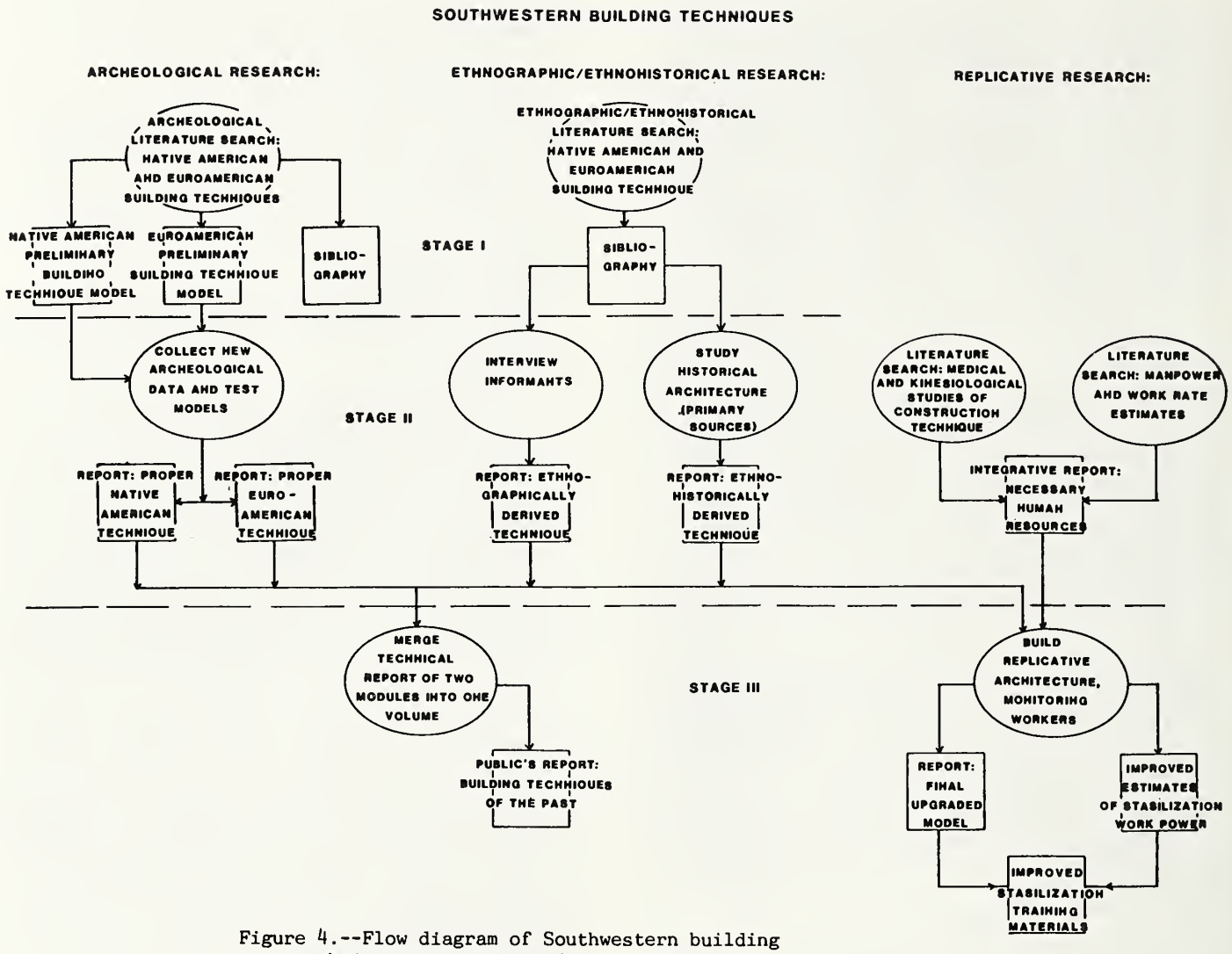

Figure 4.--Flow diagram of Southwestern building techniques research project, composed of three research modules.

Schiffer's (1976) behavioral chain model to Native American construction. Under such a scenario, hypothesized activity segments might include the location, acquisition, and homeward transport of various component materials, alteration of individual stones prior to setting them, post-emplacement modification of wall surfaces, roof construction and floor building stages, the addition of interior features, and periodic maintenance. This method would also create an inferential context for the tool kits, raw material, stockpiles, and byproducts attendant to the industry. Ultimately these factors would result in improved public appreciation of Native American construction-related skills, as well as contribute to preservation of heritage and research values through better trained and more sensitive stabilization personnel. Obviously, the same model could apply equally well to log cabin construction or other examples from the Euroamerican tradition.

Project Products

In order to accomplish this goal, the research just described must generate products that distribute project results to three target groups: the archeological profession, the general public, and stabilizationists or preservationists. An archeological report or suite of reports dealing with each project component is needed as a pure research product that distributes analytical and experimental data; however, it is only an antecedent report. Copies of this report, or of a less technical version, could be marketed in an attempt to influence public attitudes about the heritage and research values that belong to early structures. A professional non-technical writer should prepare any such volume.

Finally, staff charged with the preservation of values through stabilization techniques will benefit from a training program design that

incorporates products from this research. Work force and labor rate data stemming from the replicative experimental component, and sourcing of raw materials that might emanate from ethnographic studies are two immediate and pragmatic applications of project information. Preparation of training materials may require a distillation of the archeological report and the matching of media with the message as part of formal training programs.

CONCLUDING SUMMARY

This paper has urged a transformation in preservation objectives from stabilizing original fabric to the preservation of social and cultural values inherent in that fabric. We have argued that fabric preservation will be a consequential by-product of this approach. The first research step is to assess survey data supplied by both past and current field studies, in order to structure data collection to replace voids in our knowledge. This is an absolutely essential and fundamental step that helps delineate the scope and intensity of research programs that follow.

Three research projects have been proposed in order to address needed preservation research issues, but they are complex. Each project consists of several modules, and ordinarily each module consists of sequential phases. Phases that are carried out simultaneously are a single stage in the research project, and normally each phase has an output or report issued prior to initiating the next stage. This provision builds accountability into the research program, and distributes research findings to interested professionals, preservationists, program managers, and technicians.

Listed in priority order, the three projects are: (1) fabric and materials studies; (2) research into alternative preservation strategies; and (3) Southwestern building techniques. Each also consists of three research modules, providing a total of nine subprojects. Although modules or subprojects could be executed concurrently, if they were carried out sequentially, the order would be:

1. physico-chemical properties of original fabric;

2. processes of deterioration;

3. identifying stabilizing chemicals or amendments;

4. fabric alteration techniques;

5. fabric environment alteration techniques;

6. documentation techniques;

7. archeological and anthropological study of Southwestern architectural techniques;

8. ethnographic and ethnohistoric study of Southwestern architectural techniques; and

9. experimental replication of Southwestern architectural techniques.

Of these, the first six are necessary projects to become proactive in preserving sites with standing walls. The last three represent potentially exciting anthropological research into the values that the prior six strive to preserve.

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Current Issues in Regional Archaeology[1]

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Abstract. -- The current Forest Service approach for characterizing the regional archaeological record is examined. It is concluded that this approach is needlessly exclusionary and, hence, does not facilitate the management of cultural resources on Forest Service land. An alternative approach is discussed -- based on principles of landscape archaeology -- that would satisfy the data requirements of managers and research archaeologists alike.

INTRODUCTION

In evaluating current approaches to archaeological survey and research, Ammerman (1981:82) observed that "There is some irony in the fact that in going back to basics we are likely to discover things about survey archaeology that we may not want to know." Following up on Ammerman's general suspicion, I have the impression that at least one basic problem affects the conduct of Forest Service archaeology. That is, there appear to vacua of knowledge that hinder the management of cultural resources under the jurisdiction of the Forest Service. At the very least, therefore, it would seem reasonable to explore the proposition that management decisions should be based on the results of current archaeological research (e.g., Watson 1985).

Research archaeologists can neither ignore the management responsibilities of the Forest Service nor presume to suggest to the Forest Service what their management responsibilities should be. It is safe to assume, however, that Forest Service management objectives are defined minimally by Executive Order (E.O.) 11593 and criterion (d) of 36CFR60 (Butler 1987). Charged with fulfilling the letter and the spirit of these laws, the Forest Service is necessarily involved with issues that pertain to the production and use of archaeological data.

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DATA REQUIREMENTS OF RESEARCH AND MANAGEMENT

It is difficult to envision how anyone could disagree with the notion that the production of reliable information about the regional cultural resource base facilitates both management and research, although the ultimate goals of each may be quite different (Knudson 1985:402-403). From the viewpoint of management, archaeological research should facilitate an evaluation of the significance or "importance" of cultural resources (Northey 1982:66). Moreover, subsequent decisions about the allocation or disposition of cultural resources necessitate that high quality archaeological data be available to guide the decision-making process (Scovill et al. 1977:43; Plog 1981:51).

The amount of common ground, however, is more apparent than real. This is so because of underlying differences in the data requirements of research and of management. Researchers often attempt to understand how different factors affect the characteristics of the data they examine while investigating particular problems (Clarke 1973). Controlling for the effects of different sources of variability often consumes a good deal of research time and effort, especially in the early stages of a project (Daniels 1972). This situation contrasts markedly with the consumption of data for management purposes. The primary goal of managers does not evolve or change because their mission is to ensure compliance with the invariant statutory foundations that define their responsibilities (Holt 1987). It is not surprising, therefore, to find that some archaeologists lodge complaints like the

following: "The proliferation of CRM surveys due to state and federal regulations has resulted in the amassing of information largely regarded by archaeologists to be about as useful as tennis shoes on armadillos" (Church 1988:53). This discontent, I argue, results from fundamental differences in how the interpretive potential of the archaeological record is viewed and how it is to be objectively characterized.

VIEWS OF THE ARCHAEOLOGICAL RECORD

Under the management view of the archaeological record, a cultural resource warrants a site designation only if it discloses a sufficient number of tools, artifact classes, or the proper artifact density characteristics (FSM 2309.4 [1987]). This threshold approach (i.e., either a resource meets or does not meet these criteria -- see especially DeBloois 1983:208-209) has two consequences: (1) some concentrations of artifacts, whose characteristics do not meet the criteria for site designation, are excluded from further management consideration; and (2) potentially meaningful technological information, such as data about the attributes of artifacts that are not discarded in concentrations, is not collected (cf. Thomas 1975). Also, with the management view, detailed descriptions of site variability become extraneous. Although some sites may be targeted for preservation or public interpretation (DeBloois 1983), their management may proceed without a consideration of how and why their characteristics vary, and thus without a consideration of how they may be used to obtain knowledge about the past (e.g., Butler 1987). Clearly, the distinction between sites and phenomena that are not sites is inadequate to cover the known range of material remains that has resulted from different forms of land-use (e.g., Ellis 1978).

These problems do not arise if the regional archaeological record is viewed as the remains of various cultural landscapes (especially Foley 1981). Given the known processes that affect the formation of the regional record (e.g., Schiffer 1987), many archaeologists conceive of it in terms of varying densities of cultural materials across space (Dunnell and Dancey 1983). With this perspective, no judgments need be made about the individual "site" status of varying concentrations of artifacts. Also, non-concentrated artifact clusters are considered as potentially informative sources of data about the technology of land-use and adaptation (e.g., Shott 1986). Hence, description focuses on the technological attributes of land-use rather than on determining whether a resource meets or exceeds a set of threshold criteria.

The landscape view of the archaeological record, however, may be managerially irrelevant because E.O. 11593 and criterion (d)(36CFR60) require the Forest Service to consider only the clustered concentrations (e.g., DeBloois 1983). Thus, some evidence about variation in off-settlement sustaining activities, such as resource acquisition and processing (e.g., Binford 1982), may fall through the conservation net. Without these data, it is difficult to see how the researcher or manager can develop an understanding of why different kinds of cultural landscapes arise or, perhaps more importantly, what the variation in the configuration of regional systems means in terms of prehistoric behavior and organization (e.g., Thomas 1985:241).

CHARACTERIZING THE ARCHAEOLOGICAL RECORD: SARG AND THE FOREST SERVICE

The site definition and site characterization procedures of the management view of the archaeological record are similar to those of the Southwestern Anthropological Research Group (SARG 1974). It is well known that SARG research was designed to test hypotheses regarding the locations of sites (Euler and Gumerman 1978:vi). Thus, the SARG research design facilitated Forest Service management objectives because the archaeological site was a convenient clerical unit (see especially Plog 1978:58; also Plog 1981; Fish et al. 1984). It is not surprising, then, that Forest Service characterization procedures focus on determining whether a cultural resource is or is not a site (DeBloois 1983:208).

According to Chapter 10 of the Forest Service's Cultural Resources Handbook (FSH 2309.24 [1987]:10.5--2), a site is a "location of purposeful prehistoric or historic human activity." This is nearly identical to SARG's (1974:110) stipulation that "a site is defined here as any location characterized by the deposition of the remains of human activity." Note that the SARG definition does not entail a concept of purposefulness, and is thereby less exclusionary than the Forest Service's. Some consequences of this subtle difference are explored below.

In the Forest Service system, a cultural resource qualifies for site designation if it discloses one of the following attributes (FSH 2309.24 [1987]:10.5-3):

(a) one or more features (undefined);

(b) one formal tool (undefined) that is associated with other cultural materials, or two or more formal tools;

(c) an occurrence of three or more artifact types (undefined) or raw material types (undefined), or two artifact types or raw material types whose abundance is sufficiently dense that 10 items are found within 100 m^2, or one artifact type or raw material type that is sufficiently abundant that 25 objects occur per 100 m^2.

Assuming that there is intersubjective agreement on what constitutes a feature, a formal tool, or an artifact type, it is unclear how to proceed if the nonassemblage characteristics (e.g., artifact density) of a cultural resource do not approach the threshold criteria (10 or 25 items per 100 m^2). How are they to be treated in terms of the "'yes' or 'no'" decision concerning site status" (S. Plog et al. 1978:385; also DeBloois 1983:212)?

Beyond these problems, the current Forest Service site definition criteria could exclude from management and research isolated occurrences of projectile points (e.g., Rice et al. 1980), ceramic vessels or vessel fragments (e.g., Schroeder 1943), and other artifacts that represent the deposition of key elements of subsistence technologies in locations where they probably had been used or stored (e.g., Simms 1986). These materials represent strong evidence, in many cases, for resource acquisition and processing activities (Oswalt 1976) that SARG was originally designed to investigate (SARG 1974:107), and which SARG would not have been excluded from site status (Jeffrey S. Dean, personal communication).

SARG categorized cultural remains in terms of habitation and non-habitation sites (also called special-use or limited-activity sites), a distinction which some members of SARG acknowledge was next to impossible to maintain consistently (Dean et al. 1978:29). Also, SARG's methods were rather flexible because material remains that were not classifiable as habitation or non-habitation sites could still be recorded as sites even though it could not be concluded that they were the result of so-called "purposeful activity." Thus, by being overly restrictive in its definition of what constitutes a site, the Forest Service reduced its potential management load by excluding a portion of the cultural record.

This situation becomes even more troubling when current Forest Service procedures for characterizing "sites" are examined (see FSM 2361.7 [1983]). Permit compliance procedures require that the environmental situation and archaeological characteristics of a cultural resource be described in terms of the categories specified on the **Archaeological and Historical Site Inventory Form** (R3-2300-2 [6/80]). Page 1 of the form (all of "Card 1" and over one-half of "Card 2") pertains to administrative or environmental data, which are unquestionably important for management purposes (Cordell et al. 1984:90).

Page 2 of the form (part of "Card 2" and all of" Card 3") is devoted to categories "that will allow for a rather detailed coding of the description of the site from its general class through its more detailed use and type" (FSM 2361.7 [1983]:39). The categories on page 2 were designed, evidently, to compile data that pertain to only one major source of archaeological variability -- function (USE). These so-called USE categories, unfortunately, are not mutually exclusive (see also Dean 1978:110-111). For example, what are the differences between the limited activity, specialized activity, and water-soil control USE taxa? This problem applies to the TYPE categories as well. For example, what are the differences between knapping [006] and manufacturing [167] as types of limited activity sites? Second, they are not operationalized to the extent that a surveyor could reliably tag a cultural resource according to one of the USE categories. For example, which attributes of a cultural resource pertain to limited activity "use" and which to habitation "use" or various combination thereof? Third, because different systemic sources of variability may produce similar archaeological remains (Sullivan and Schiffer 1978:168-169), the USE and TYPE categories obscure potentially meaningful variation (Sullivan 1987a). Fourth, as is implied by their labels, the USE and TYPE categories are not interpretation-neutral, and thereby bias or render uncertain any inferences based on them (Plog et al. 1978a:142). In summary, current Forest Service site definitions and characterization

procedures, which provide more than enough information for management purposes, are insufficient for addressing contemporary research problems in settlement archaeology (cf. Plog et al. 1978b).

CHARACTERIZING THE ARCHAEOLOGICAL RECORD: BEYOND THE FOREST SERVICE VERSION OF SARG

In order to overcome the limitations of the Forest Service's version of the SARG paradigm (Sullivan and Schiffer 1978), and to enhance the research potential of cultural resources on Forest Service land, alternative approaches to survey and settlement archaeology need to be explored. The particular view advocated here contrasts with the Forest Service's in several important respects. An examination of these points of departure illustrates why an alternative approach would benefit the research and management concerns of the Forest Service.

This approach is based on new understandings of how societies interact with their surroundings and how such interactions affect the character of the archaeological record (e.g., Graham and Roberts 1986:108ff). For example, as a result of a substantial amount of research on the ethnoarchaeology of land-use (e.g., Binford 1982; also Torrence 1983), it is clear that people of non-industrial, small-scale societies spend a considerable amount of time away from their perennial settlements or home bases (see especially Eder 1984), and, furthermore, that extensive land-use is a common feature of all human societies, be they hunter-gatherers or farmers (e.g., Martin 1985; Ferguson and Hart 1985). With this perspective, sites are but "points on the landscape where a high frequency of activity occurs, and the differences between various parts of the landscape become ones of degree and not kind" (Foley 1981:2). Furthermore, as an alternative view on land-use and the formation of the regional record, the post-SARG paradigm affects considerably how units of observation are defined and how they are to be operationalized. For example, description focuses on characterizing variation in the attributes of cultural resources regardless of their clustering (Dunnell and Dancey 1983:273). The post-SARG paradigm also avoids the problem of pigeon-holing high density clusters, which often have properties that overlap among non-discrete site types (FSM 2361.7:39-42), into a single taxon (Sullivan and Schiffer 1978).

Also, the post-SARG view of settlement archaeology enhances our ability to identify which sources of variability may have affected the evolution of regional landscapes and how those sources may have changed over time (Scovill et al. 1977:45). These sources of variability include the following (Sullivan 1987b):

a) functional variability, which refers to the nature and range of activities conducted at certain locations;

b) occupational variability, which refers to how long, how intensively, or how frequently a particular location was inhabited;

c) organizational variability, which refers to how societies schedule or allocate their time and labor during the execution of different activities;

d) cultural variability, which refers to how different societies used the same landscape.

Characterization procedures based on the post-SARG paradigm generally entail some form of artifact inventory. Sometimes, the artifact content of all but the largest and densest clusters of artifacts can be exhaustively enumerated (e.g., Downum and Sullivan 1988). For large and dense artifact clusters, a form of intensive transect or grid recording may be especially useful (e.g., Rankin 1986:31-32; also Cowgill 1985:384). Thus, in contrast to the site characterization procedures outlined in FSM 2361.7 (1983), the inventory method actually counts the number of artifacts of different types that are present on the ground's surface (e.g., Wilcox et al. 1981). In fact, it is a standard procedure of some intensive surveys to obtain frequencies of ceramics (preferably by type), flaked stone artifacts (debitage, cores, unifacial tools, bifacial tools), groundstone artifacts (e.g., manos, metates), and other miscellaneous large (e.g., hoes, worked stone) and small (e.g., shell, bone, etc.) artifacts (Camilli 1988; also Downum and Sullivan 1988). The importance of artifact type and class frequency data is that they facilitate, by conversion into percentages (Thomas 1985:242), the derivation of a number of key variables, such as sherd/lithic ratios (e.g., Synenki 1984), decorated/undecorated ceramic ratios (e.g., Powell 1984), and multiple artifact class (MAC) or non-MAC areas (e.g., Czaplicki and Heathington 1986:36-40), that increase the archaeologist's ability to understand how different sources of variability have affected regional archaeological data (Sullivan 1987b).

NEW DIRECTIONS IN FOREST SERVICE ARCHAEOLOGY

Current Forest Service views on survey and settlement archaeology have been examined with respect to their underlying assumptions about what the archaeological record represents in terms of human behavior and land-use. Under the management view of the archaeological record, site definition and site characterization procedures (see FSM 2361.7 [1983] and FSH 2309.24 [1987]), which are remarkably similar to those of SARG (see especially Gaines 1978), are of limited interest to research archaeologists. First, the paradigm is flawed by its untenable view that decision-making, especially with regard to the location and formation of "sites," is influenced primarily by resource optimization strategies (e.g., Plog and Hill 1971:13). Clearly, a variety of factors, other than propinquity to so-called critical resources, affects the deposition of material culture across a landscape (Sullivan and Schiffer 1978). As Johnson (1977:501) has argued "most models of locational behavior are essentially unverifiable in that for the sake of generality they involve assumptions which are untestable or which cannot be expected to be met under real world conditions." Second, the SARG paradigm is only partially explanatory in view of its focus on functional variability as the primary factor affecting the properties of the regional resource base (e.g., Upham 1984). Ethnoarchaeological (e.g., Ebert 1979) and archaeological studies (e.g., Sullivan 1987a) have shown that the nature of the regional record can be affected by different sources of variation and interactions among them.

Problem-oriented research in settlement archaeology is hampered significantly by a focus only on the distinction between sites and phenomena that are not sites (e.g., Downum 1986:216). As Dunnell and Dancey (1983:274) have argued, "important elements of the total archaeological resource will be purged or simply mismanaged because they are not easily incorporated within this system." Because of its current emphasis on high-density artifact clusters or "sites," there is thus a danger of biasing the range of cultural phenomena that the Forest Service is charged with managing.

An alternative perspective of the regional resource record, which has benefits for managers and researchers alike, is based on new views of how human societies -- especially those with broad-spectrum subsistence economies (see Jorgensen 1983) -- "work" environments. As noted above, results from ethnoarchaeological studies of land-use (e.g., Binford 1983; Eder 1984; also Martin 1985) have alerted archaeologists to the functional, occupational, and organizational factors that affect variation in the material connections among technology, activities, and land-use (e.g., Jarman et al. 1972:61-62). After all, the primary evidence that guides Forest Service management decisions is variation in technologies (material culture design) that developed, presumably, to solve problems of human adaptation (e.g., Oswalt 1976). There appears to be no a priori basis, therefore, to disregard certain aspects of the cultural resource base -- any "techno-unit" may have been important depending upon the problems that the designers of the technologies were attempting to solve (e.g., Winter 1983). Also, recent research has shown that decisions affecting the design of technologies, as well as the factors that influenced where certain technological elements were discarded or abandoned, depend on a number of considerations, such as mobility (Kelly 1983) and hunting ranges (Binford 1979). In order to identify "significant" cultural resources it is essential to consider the possibility that a range of factors, beyond those generally represented at high density artifact clusters, affected the composition of the regional archaeological record (see especially Camilli 1988).

Given this alternative view of how the regional record may arise, it was suggested that new methods be considered for characterizing cultural resources on Forest Service land. One of the major features of the landscape approach is that it attempts to identify and control known sources of variability. As a result, bias is reduced in the range of resources that should fall under the Forest Service's preservation mantle. In order to provide high-quality data that would be useful to researchers and managers, the Forest Service should consider adopting, or at least testing, the inventory method for characterizing artifacts and artifact cluster assemblages that are encountered during survey. With the inventory approach, characterization moves beyond a typological approximation exercise that focuses on the "site" exclusively (FSM 2361.7 [1983]:43). Cultural resources, regardless of their degree of artifact clustering, can be described in terms of

artifact class (or type) frequencies and percentages. In this way, attributes of past cultural landscapes are developed that do not depend on subjective field decisions (see Wilcox et al. 1981).

CONCLUDING REMARKS

In closing, it is crucial to stipulate that these suggestions and alternatives have been offered to enhance the management of a broad range of cultural resources -- not just "sites" (Plog 1974:71) -- and to facilitate the investigation of some of the factors that influence the evolution of cultural landscapes. It is clear that management responsibilities must be expanded to include "less densely concentrated" aspects of the archaeological record, thereby reducing bias in what is managed and what is preserved. If we assume that management policies do not define research problems but do affect how the regional cultural resource record is characterized, then the adoption of the post-SARG paradigm should satisfy managerial requirements and the data requirements of archaeological research. In this way, both cultural resources management and cultural resources research will truly contribute to the substantive knowledge and theoretical development of archaeology.

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Cultural Resources "Catch-22" and Empirical Justification for Discovering and Documenting Low-Density Archeological Surfaces[1]

LuAnn Wandsnider[2]

Abstract.--High-density remains are well represented in the current cultural resource data base, but are poorly described. Low-density remains are well described, but are not reliably represented. Both descriptive resolution and complete representation cannot be increased for both at this time. This paper demonstrates, however, that it is essential and possible to deal more effectively with sparsely distributed cultural resources, which afford a unique perspective on the past and which cannot be protected through avoidance.

INTRODUCTION

Cultural Resource Management on the Forest and elsewhere is in a classic "Catch-22" situation. Resources that are well-represented in the cultural resource data base, i.e., high density remains, are those for which minimal documentation is available. Resources that are well-documented, i.e., low-density remains, are those that are unsystematically represented in our data base or are represented at a very low level relative to their occurrence on the ground. Resources for which the documentation enters the cultural resource filing system, i.e., sites, are also those for which protection through avoidance is commonly recommended, although this may vary by Forest and by Federal agency. Resources that are not classified as sites do not enter the cultural resource filing system and are often not protected. Current discovery and documentation practices, discussed in greater detail below, result in a cultural resource data base with a very curious and uneven character. Yet, with this data base, management decisions are made that directly impact the present conservation and future collection of cultural resource information.

This paper discusses the quality of the document of cultural resources on the Forest with specific reference to differential discovery and documentation. General statements about the treatment of cultural resources with different characteristics are presented. It is suggested that it may be desirable, for both management and research purposes, to maximize both the representativeness and quality of the cultural resource document for the Forest. Such an effort, it is recognized, is neither feasible nor practical for all cultural resources on the Forest. For low-density cultural resources, however, where avoidance is untenable, such high-resolution documentation is critical. Support for this statement comes from the unique contribution towards understanding the past that is offered by this kind of resource. Low-density archeological remains are a different kind of archeology not duplicated in high-density cultural resources, as demonstrated here by the results of several survey projects from the American West. Such resources should therefore be treated with the same reverence that higher-density remains presently are accorded. By taking steps to ensure representativeness, upgrading and standardizing documentation practices, and by allowing this information to be accessible within a filing system, low-density archeological remains can, with very little additional effort on the part of Forest CRM specialists, provide important and unique information about past use of the Forest.

CULTURAL RESOURCES DISCOVERY

Discovery of cultural resources has obvious implications for its protection from subsequent activities that occur on the Forest. Cultural resources cannot be actively protected if they have not been detected. Present discovery procedures involve the actual sighting of a surface manifestation of a cultural phenomenon. This sighting event, however, is influenced by several interacting factors as discussed by Plog,

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Plog, and Wait (1978), Schiffer, Sullivan, and Klinger (1978), and others. In the following discussion, I will highlight artifact/feature obtrusiveness, artifact clustering/dispersion, and surface visibility as factors that most directly influence discovery bias in low- and high-density distributions of archeological materials.

Obtrusiveness refers to the extent that a cultural resource element, an artifact or feature, contrasts with the environment or context in which it is located. By virtue of their obtrusiveness (Schiffer et al. 1978), architectural remains are more easily discovered than artifactual remains. At the same time, obtrusive artifacts, i.e., those that are large or otherwise conspicuous, are more easily found than small artifacts. The data in figure 1 come from two distributional surveys (the Seedskadee Project and Navajo-Hopi Land Exchange Project, discussed later) in which artifact discovery consisted of two passes through the survey unit. The first was a systematic pass, during which time all discovered artifacts were flagged in orange. It was followed by an unsystematic pass, during which time flagged items were field-analyzed and more artifacts were found, flagged in red, and analyzed. Most large artifacts were discovered during the first pass through the survey unit. For small chipped stone artifacts, between 40% and 50% of the total number discovered during all passes were found during the first pass. Foley (1983) has noticed a similar tendency and other attributes of artifact coloration with respect to discovery are discussed by Camilli and others (1987).

At the same time, individual artifacts belonging to an artifact cluster are more easily found than dispersed artifacts. Figure 2 is derived from an experiment in which artifacts, painted washers and nails, were introduced into a survey unit prior to survey (Wandsnider and Ebert 1984). Only 22% of those artifacts seeded so as to represent "isolated finds" were recovered by the survey crew, who used intensive (5 m transect interval) survey methods. Of those artifacts introduced onto the landscape as artifact clusters, the percentage of artifacts discovered increased with the density of the artifact cluster (fig. 2).

Surface visibility will also influence discovery of cultural resources. In his survey of both grassy and non-grassy areas within the Amboseli Reserve in Kenya, Foley (1983) observed that higher artifact densities were found in the latter. He used multiplicative factors to control for the differential discovery of artifacts, which he attributed to the presence/absence of surface cover. Geomorphological processes may introduce a similar surface visibility bias. Figure 3 presents the distribution of site sizes recorded on the Cibola National Forest. The distribution varies according to depositional and erosional context. The classification of site context was

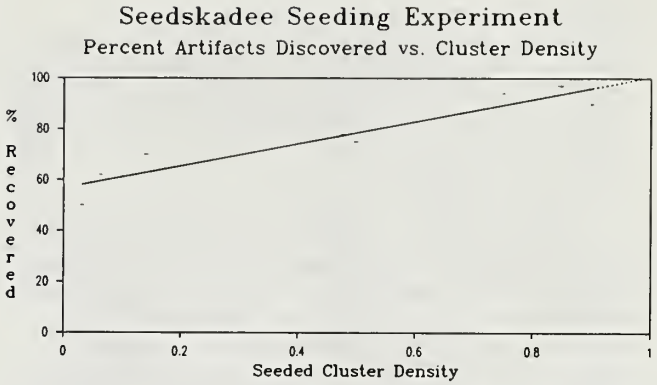


Figure 1.--Percent artifacts discovered vs. seeded cluster density (artifacts / sq m) from the Seedskadee Project seeding experiment.

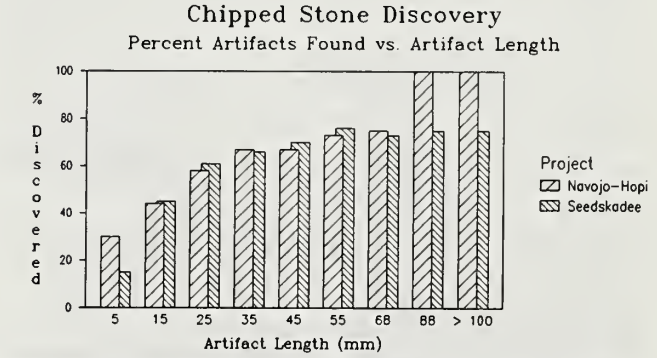


Figure 2.--Percent orange-flagged chipped stone artifacts vs. artifact length for the Navajo-Hopi Land Exchange and Seedskadee Projects.

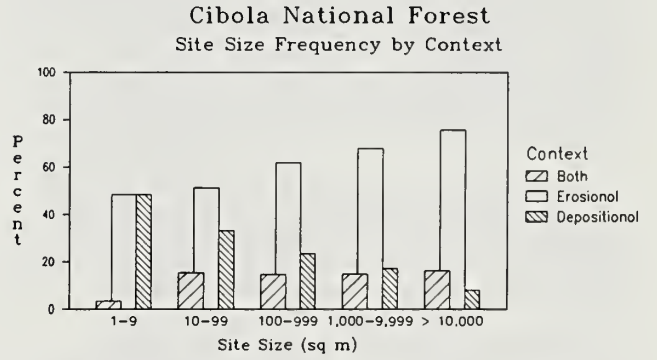


Figure 3.--Size distribution of Cibola National Forest sites with respect to depositional and erosional contexts and contexts that are both depositional and erosional.

derived from the Landform variable on the Forest site form. Sites recorded as small are found in equal proportions in depositional and erosional environments. These relative proportions change as recorded site size changes. Sites recorded as large are more often found on landforms classified as erosional rather than depositional. Does this pattern reflect

differential use of the landscape by past cultures? Or, is this pattern attributable to surface processes that have left exposed only a small portion of an expanse of cultural remains that lie just beneath the surface in depositional contexts? Insufficient data exists at present to resolve this question.

Each of these factors of obtrusiveness, local density, and surface visibility conspire to imbue different cultural resources with varying potentials for discovery. Thousand-room pueblos located on devegetated plains have the highest potential for being discovered and, in most cultural resource data bases, are the earliest entries. A few biface thinning flakes, left behind in what has come to be a Ponderosa forest, have the lowest potential for discovery. Few cultural resource data bases will contain this item.

CULTURAL RESOURCE DOCUMENTATION

Once discovered, no matter the difficulty of discovery, cultural resources with different perceived characteristics are treated differently. The following generalizations about documentation procedures are based on limited experience in working with the New Mexico ARM file system and the Cibola Forest site file. Four dimensions of documentation can be identified and include: 1) the gross location of cultural materials on the landscape (e.g., the dot on the USGS 1:24,000 map), 2) finer locational information for elements of an archeological assemblage (e.g., the site map), 3) descriptive information about the contents of the assemblage, and 4) accessibility of that document to those who wish to use information about the kind and distribution of cultural materials. By accessibility of documented information, I refer to whether that information is placed into and retrievable through a systematic filing system.

Cultural resources with different densities and frequencies are differentially documented with respect to each of these four dimensions as summarized in Table 1. Gross locational information is available for most cultural resources. The accuracy of this locational information is probably highest for those cultural resources that occur over a large area, due to the nature of mapping small-area phenomenon at large scales. That is, it will be more difficult to relocate an isolated find (or even a single-room feature) using its mapped location on a USGS quadrangle than it will be to find again a lithic scatter dispersed over 10,000 sq m.

Locations of individual elements of an assemblage are mapped if the economics of the situation permits it. I use the term element to refer to each of the artifacts and features that contribute to an assemblage. As the number of artifacts and features increases, the resolution

Table 1.--Documentation of cultural resources according to characteristics of element frequency and area of dispersion. Slash (/) indicates either/or.

Document Dimensions	Cultural Resource Characteristics: High Element Frequency / Small Area	High Element Frequency / Large Area	Low Element Frequency / Small Area	Low Element Frequency / Large Area
Gross Location	X	X	X	X
Fine Location			X	X[1]
Detailed Description	No/Sample	No/Sample	X	X
Accessibility	X	X	X[2]	X[3]

[1]Elements of the cultural resource may or may not be finely mapped. If status is that of an isolated find, gross mapping and fine mapping may be one and the same.

[2]If recorded as a site, the cultural resource is accessible in site file system and survey report. If recorded as an isolated find, cultural resource documentation is available in survey report.

[3]If recorded as part of one site, cultural resource is accessible in site file system and survey report. If recorded as multiple isolated finds, cultural resource documentation is in survey report.

of spatial information decreases because it takes more time to map more items and recording time is limited, and because current management practices make detailed documentation unnecessary (see below). If artifacts or features are widely distributed over an area and no clustering is evident, these may or may not be individually mapped. If mapped, they may be termed isolated finds, in which case a gross location would be secured for each, or they may be mapped as elements of one large, amorphous site.

Descriptive resolution of assemblage elements likewise changes with element frequency and relative density. A single artifact or feature may be described in detail. Conversely, a dense scatter of artifacts may be grossly described as to relative frequencies of artifact type **x**. Alternatively, a sample, biased or unbiased, of the dense artifact scatter may be described in detail.

Accessibility of documented cultural remains depend upon decisions as to their status. Those remains ascribed the status of "site" may find their way into a systematic inventory of sites kept either by the Forest and/or the state in which it was located. Those termed "isolated finds," while available in unpublished survey reports, are usually otherwise inaccessible.

To summarize, we have good gross locational information about all cultural resources. Cultural resources with few elements are well described and often individually located so that structural information about the assemblage is available. These resources, however, may or may not be accessible in a paper or magnetic archive of cultural resources. Conversely, cultural resources with many elements are often not well described, are usually not individually located (but may be mapped according to intra-site areas or loci), and, since these usually are described in terms of sites, will be incorporated into a site filing system. Those items that are best described and mapped, if termed isolated finds, are those remains that are least accessible.

Those resources, which by virtue of their size or complexity are most likely to be poorly described and only grossly located, are those that are accessible in filing systems.

This unequal treatment of cultural resources in terms of documentation procedure reflect management decisions that have to do with which cultural resources are avoided and which are not. These management decisions have two aspects, each of them related to the eligibility of a resource for nomination to the National Register. Aspects include the cost of adequate documentation and the implicit assumption that the more elements at a place, the more important the place. Each of these aspects is examined in turn.

A decision about which cultural resources to preserve through avoidance and which to preserve through extensive documentation rests on economics and a determination of eligibility or potential eligibility of a resource for National Register nomination. On the Cibola Forest, the CRM policy of which I am most familiar, all high-density cultural resources designated as sites are considered to be potentially eligible to the National Register under Criteria D (research potential), if for no other reason, and are treated as such. Such a policy internalizes the observation made by Tainter (this volume and elsewhere) that future research data requirements cannot be anticipated. On other Forests and for other Federal agencies, the eligibility of the site may be evaluated on a case by case basis. All sites determined eligible or potentially eligible, however, either must be avoided or their information potential conserved through adequate documentation. The more material there is to document, the more it will cost to document those resources. Therefore, avoidance is least costly in terms of dollars spent and in terms of the conservation of a nonrenewable resource. Where possible, avoidance is the preferred form of preservation (but see Spoerl, this volume).

The other "Tutonic" aspect to management decisions, that more artifacts or more features have more intrinsic importance than a few of the same and therefore should be avoided, is not explicitly articulated anywhere that I can find, but is present nevertheless. For example, I have had conversations with archeologists in the Forest Service, in other Federal agencies, in the private sector, and in academic institutions, and with representatives of the State Historic Preservation Office in New Mexico in which this sentiment is expressed. It likewise permeates, but is nowhere expressed in, documentation concerned with nomination of cultural resources to the National Register of Historic Places. The reasoning behind this feeling is not clear but may have to do with notion that the amount of information about the past is directly and incrementally related to number of assemblage elements. This reasoning also holds that a single feature contains more information than a single artifact. The perceived low information content of few element cultural resources may be because these remains are seen to represent accidental (e.g., projectile point loss or "pot drop") rather than deliberate activities. Or, these remains are felt to be from limited or special as opposed to residential activities, the latter being somehow more important than the former. Within formation process archeology, however, a loss event is just as important as a production event; both contribute to the form of the archeological record (Schiffer 1987).

The relationship between number of archeological items in an assemblage and its information content is a complex topic that will be addressed elsewhere. For the purposes of this discussion, however, I suggest that this relationship requires definition. The following examples of archeological assemblages with varying density characteristics, however, tend to support the opposite. That is, they suggest that low-frequency and low-density archeological materials provide unique insight into past uses of the landscape and are therefore just as rich in information as cultural resource deposits with large numbers of assemblage elements.

EXAMPLES OF ARCHEOLOGICAL SURFACES

The following examples are derived from several cultural resource management projects and one "pure" research project that have been conducted throughout the western United States. Except for the latter, the areas in which these projects were conducted are arid and the largest "trees" found here are greasewood, sage, and mesquite. That is, these cultural resource data were collected under optimal conditions of surface visibility, which are infrequently found on the Forest. The other research project occurred in southeastern Oregon and in addition to sage and desert scrubland, stands of juniper and aspen were surveyed.

Figure 4 considers assemblage content according to relative artifact density for the Bureau of Reclamation San Luis Valley project in

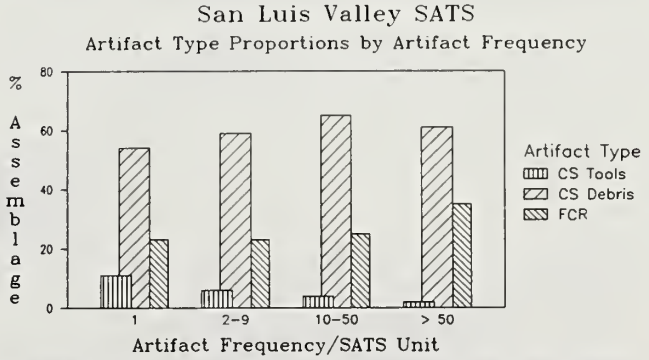


Figure 4.--Artifact type proportions vs. artifact frequency from the San Luis Valley Systematic Aligned Transect Survey.

south-central Colorado (Button 1987). In this instance, artifact frequencies are derived for each unit of systematic aligned transect survey (SATS). One SATS unit was surveyed with 5 transects, each 6 ft. by 528 ft. and spaced 100 ft. apart. Overall, chipped stone tools contribute little to the total assemblage makeup. Assemblages from those areas with low-artifact density, however, are different from high-artifact density areas. In the former, chipped stone tools comprise a larger proportion of the surface assemblage than for the latter areas. As artifact density increases, this density is contributed to more heavily by first chipped stone manufacturing debris and then fire-altered rock.

As similar tendency is seen in figure 5, which presents assemblage information for the Bureau of Reclamation Seedskadee project area located in southwestern Wyoming (Drager and Ireland 1986; Wandsnider and Larralde 1986). These frequency data were derived from a grid of 25-m cells imposed on distributions of more than 17,000 point- and one meter cell-provenienced artifacts. The surface assemblage of low-density cells are composed of relatively more formal and informal chipped stone tools than is true of high-density cells. As density increases, chipped stone manufacturing debris comprises more and more of the assemblage. Cell assemblages with very high densities contain high proportions of fire-altered rock.

At least for the Seedskadee data, artifact density seems to bear little relationship to the portion of the tool found. Other studies (Torrence 1983; Binford and O'Connell 1984) have suggested that tool refurbishing will occur during downtime while other activities are underway or in the course of gearing-up activities at the residential base. In addition to other qualities, each of these sites would be expected to have relatively high artifact densities, if they were used for any length of time. Therefore, it is expected that tool portions such as projectile point bases should be found in areas of relatively high artifact density. Whole points are often thought to be due to loss and therefore might be expected to be found in places with low-artifact density. A

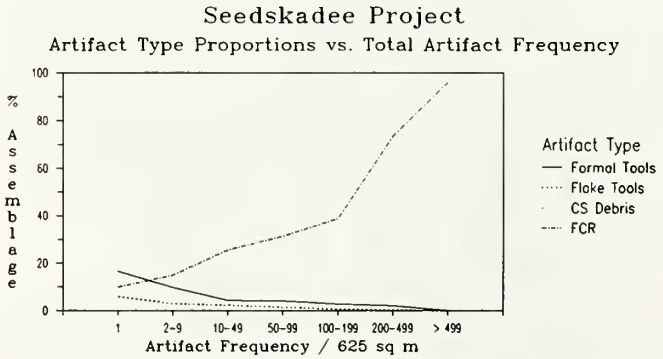


Figure 5.--Artifact type proportions vs. total artifact frequency for Seedskadee grid cells.

consideration of Seedskadee chipped stone tools shows little association between artifact density and either tool status (fig. 6A) or tool portion (fig. 6B). This patterning suggests that assemblages that appear to be both low- and high-artifact density are at locations where tool refurbishing or loss occurred. Or, it suggests that artifact density, as an indicator of "people time" spent at places, requires examination. Or, the conditions under which tool portions enter and leave the archeological context (Schiffer 1972) demand more investigation.

Previous examples have dealt with artifact densities as estimated for areas with specific dimensions. When the respective assemblages of sites vs. isolated finds are considered, a similar trend emerges. The data presented in figure 7 come from the Steens Mountain Prehistory Project (Jones 1984: Tables 5.3-5.7, 5.11, 5.13, 5.17), conducted in southeastern Oregon. Low-density areas were recorded as off-site areas, while high artifact density areas were recorded as sites. Almost all artifacts from both areas were collected for laboratory analysis. For some site areas, however,

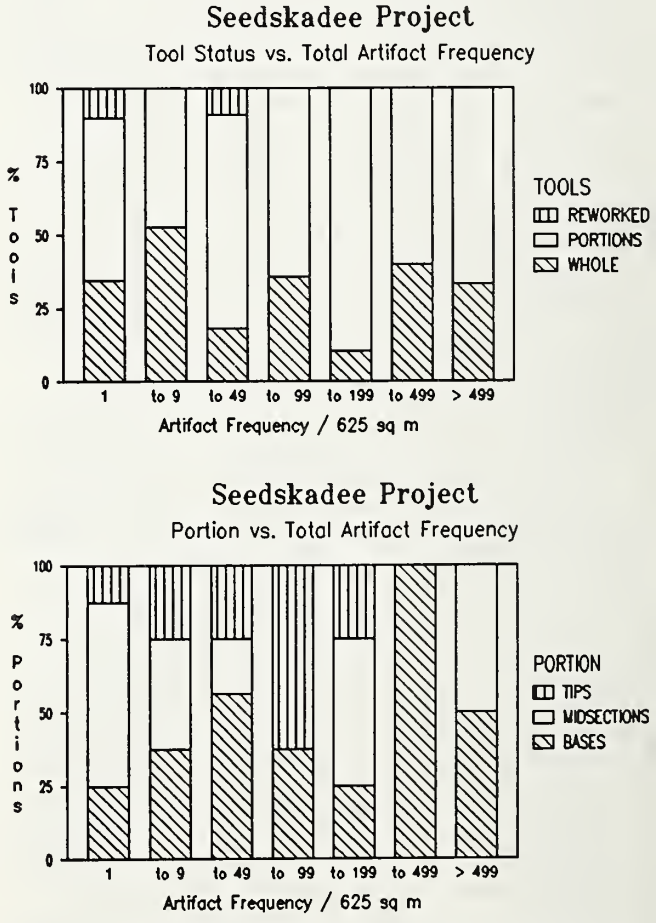


Figure 6.--Seedskadee chipped stone tools with (A) tool status vs. artifact frequency per grid cell and (B) portion percentages vs. artifact frequency per grid cell.

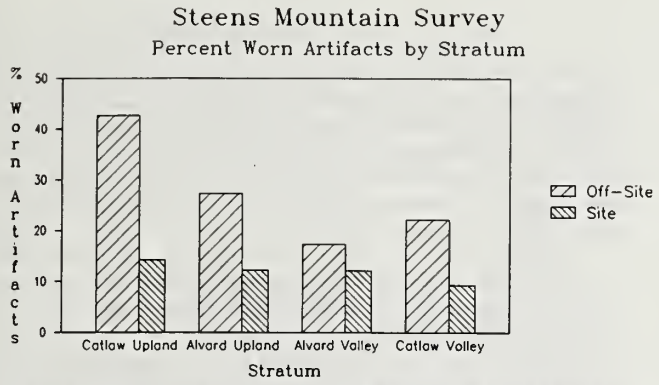


Figure 7.--Percent worn chipped stone artifacts by stratum for Steens Mountain off-site and site survey areas.

artifacts were collected according to various sampling schemes. In the figure 7, only those sites for which all artifacts were collected are included in these calculations. In off-site areas, the proportion of worn artifacts is higher than that found in sites, when geographic stratum is held constant. The variability in proportions between strata are interesting in and of themselves but do not directly relate to the point to be emphasized here. This point is that off-site or low-artifact density areas have a very different artifact assemblage than site or high-density areas.

Data from the Navajo-Hopi Land Exchange project in south-central New Mexico show a similar tendency. Artifacts were provenienced to the nearest centimeter or meter in this project and were described in detail in the field. Coordinates for each artifact where forced into spatial clusters using proximity criteria (see Camilli et al. 1987). Those artifacts that could not be clustered by the algorithm consist of proportionately more formal chipped stone tools, informal flake tools, and groundstone (fig. 8). In clustered assemblages, relatively more ceramics and fire-altered rock occur.

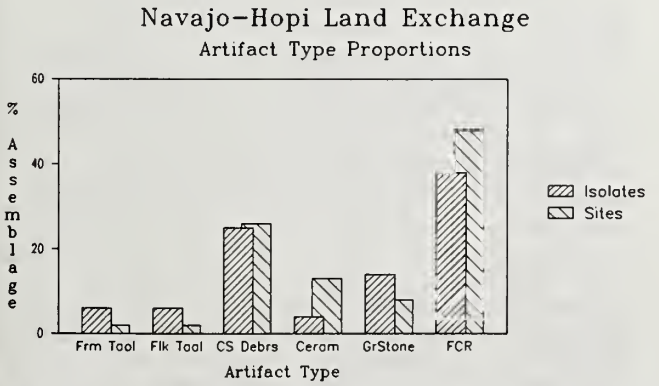
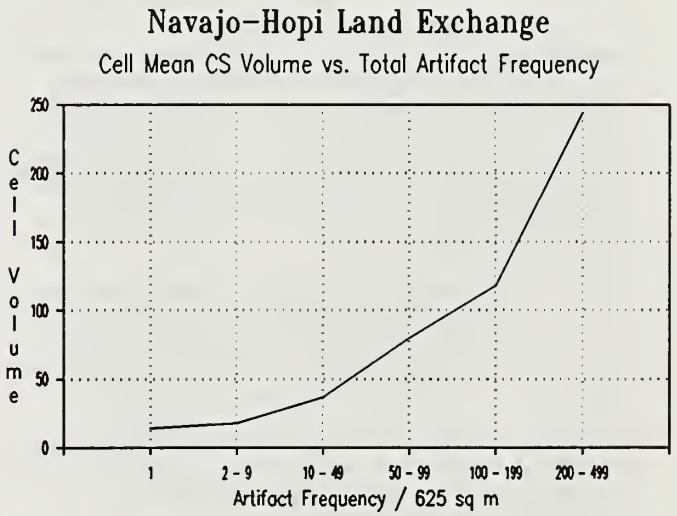


Figure 8.--Navajo-Hopi Land Exchange artifact type proportions for derived "isolated finds" and "sites."

When artifact density, derived for 25-m grid cells, is considered for Navajo-Hopi archeological surfaces, relationships between local artifact density and volume of chipped stone can be discerned. As artifact density increases, the average total amount or volume of chipped stone material for which metrics were recorded likewise increases (fig. 9A). Chipped stone volume was calculated by adding up for each grid cell all chipped stone volumes estimated by the multiplication of artifact length, width, and thickness. At the same time, individual chipped stone artifact size decreases with increasing artifact density (fig. 9B). Low-density areas are characterized by a few large chipped stone artifacts; high-density areas are characterized by many, many small pieces of chipped stone. Frequencies and sizes for those chipped stone artifacts such as angular debris, which were assigned to a gross size class, mirror this same tendency.



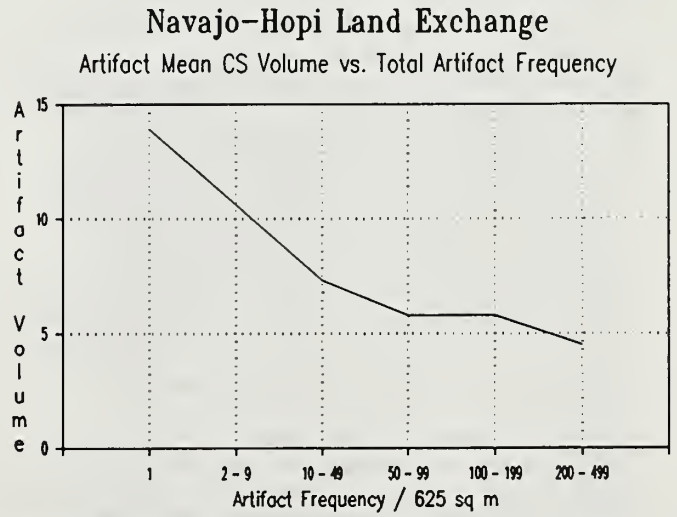


Figure 9.--Navajo-Hopi Land Exchange chipped stone volumes vs. total artifact frequency per grid cell for (A) cell mean volume and (B) artifact mean volume.

DISCUSSION

The patterns evident in the above examples are both mundane and surprising. One one hand, we know that chipped stone manufacturing entails the production of large quantities of waste material. Likewise, plant processing that employs heated rocks rarely generates a few fire-altered rock and more commonly generates a quantity of fire-altered rock. It is therefore not surprising that when an archeological assemblage is made up of many artifacts, those artifacts are referable to activities that generate large quantities of non-biodegradable by-products. On the other hand, the relationship between assemblage density and assemblage makeup, in that it is found in all assemblages considered, is interesting and informative. It suggests that no matter where or how one looks, low-density phenomenon are not a sparser version of high-density archeological materials. That is, they are unique.

This patterning inspires several observations. First, site definition criterion, which usually focus on relatively high artifact densities, should entail that locations where chipped stone manufacturing and food processing using hearth rock should be very well-represented in our site files. Low-density cultural remains, where perhaps isolated as opposed to recurrent activities occurred in the past, are under-represented because our discovery methods do not find them. When they are found, they are called isolated finds and therefore do not enter the cultural resource filing system. It is unlikely, therefore, that the patterns described here, which relate assemblage density and assemblage composition, could be discernible in the current data base. Yet, such patterning provides a vital clue as to past uses of the landscape and to present analytic needs to understand such variability.

Secondly, we have few modern referents for chipped stone tool manufacturing, use, and discard. While there are modern peoples who use ceramics and groundstone, it is not necessarily the case that those items function in the technological system in capacities similar to their prehistoric counterparts. This possible difference in tool role is due to the fact that other aspects of the cultural system, e.g., subsistence and mobility, are likely very different today than in the past. For us to understand the role that tools of any type played in past cultural systems, inductive analytic strategies, grounded by knowledge of how other tools function in modern systems, must be employed. In any inductive analysis, the referential domain of the varying data items structures and enlightens the analysis. The archeological context of assemblage elements is therefore critical to this analysis and many different kinds of contexts, low-density, high artifact density, with structures and features, without structures and features, etc., are likewise vital.

IMPLICATIONS FOR MANAGEMENT

If it is agreed that low-density cultural remains are an important source of information about the use of the Forest by past cultural groups, implications for cultural resource management can be far-reaching. Both current discovery and documentation methods would be affected.

At present, discovery methods are not geared towards locating all low-density cultural remains. Because of the factors of obtrusiveness, relative density, and surface visibility discussed at the outset, even intensive survey yields only a small proportion of elements that actually exist in low-density situations. The moderate intensity at which survey is conducted on the Forest can be expected to return an even smaller proportion. Yet, this moderate intensity may be sufficient for capturing the information content of this unique cultural resource. If it can be demonstrated that located items faithfully represent, at some low and unvarying level, the total population of surface elements, than moderate-intensity survey can suffice. That is, if with increasing coverage the same relative proportions of elements are found, than a moderate-intensity survey may produce as much information as a high-intensity survey, at least with respect to non-clustered remains. The fact that increased survey intensity usually results in increased artifact densities, would have to be taken into consideration in the course of this evaluation.

A demonstration of the above may in fact show that moderate-intensity survey cannot reliably find low-density or sparsely distributed remains. In this case, it may be worthwhile to increase survey coverage in those specific situations where optimal surface visibility exists. Where visibility windows have been provided, due to fire, or where artificial erosional surfaces have been created, as with disking operations, survey intensity may be profitably increased.

The major modification to current Forest Service cultural resource management lies in the documentation and accessibility of documented materials for low-density remains. Introduction of a standardized recording format for those resources ascribed the status of isolated finds might be the first step. The second might be the creation of an isolated find file to be maintained concurrently with a site file. With such a system in place, the unique information provided by low-density remains will not be totally destroyed, even if the remains themselves are. Geographic Information System (GIS) technology lends itself nicely to the inventory and data management of both low- and high-density phenomenon. Integration of cultural resource locational and descriptive information, at a scale of resolution of use to managers, into the total fabric of resource management could be facilitated in this way.

High-resolution documentation is an acknowledged means of cultural resource conservation when avoidance is impossible. This paper has attempted to demonstrate that this same rationale for dealing with high-density cultural remains should be extended to low-density cultural resources, since they provide unique information on the past. Throughout this paper I have referred to low- and high-density cultural resources as though they were separate entities that could easily be distinguished in the field. In reality, each of these represents polar extremes on a continuum of density (Dunnell and Dancey 1983). Technology is rapidly becoming available that will permit the cost-effective documentation of cultural resources along this density continuum in an atomic, i.e., element by element, fashion. By taking steps now to deal with the issue of discovery and documentation of sparse distributions of cultural resources, the Forest Service can anticipate and participate in the development of this new technology. More importantly, it can take measures to conserve information about the past that is as irretrievable as that found in high-density cultural resource deposits and is perhaps more easily managed.

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Landscape Archaeological Research and Cultural Resources Management[1]

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Abstract. -- Forest Service cultural resource research should focus on three priority problem domains: (1) cultural resource discovery, (2) cultural resource characterization, and (3) natural resource discovery and characterization. A research program is described that entails the establishment of Cultural Resource Research Areas (CRRAs) to serve as dedicated laboratories where experiments can be conducted that pertain to each problem domain.

INTRODUCTION

Current Forest Service procedures for discovering and characterizing the regional archaeological record may not support a full range of management options. Some specific difficulties that we have identified pertain to questionable assumptions about how people have used land in the past and to the interpretation of the material results of past land-use (Sullivan, this volume). One of the most significant problems is that the unit of documentation currently used by the Forest Service -- the "site" -- may be needlessly exclusionary and incapable of accommodating all of the cultural remains on Forest Service land. As a result, survey and inventory strategies that employ the site as a clerical taxon may not produce reliable, consistent, and replicable results.

CULTURAL RESOURCE RESEARCH AND LANDSCAPE ARCHAEOLOGY

In response to these and other problems (see Priority Research Problems below), we propose the following research program. The primary goal is to provide the Forest Service with information that can be used to manage cultural resources more effectively. The objectives are to develop and test techniques and methods for discovering and documenting the full range of

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cultural resources on Forest Service lands. Based on the results of this research program, recommendations will be made for generating information to guide management decisions regarding the allocation and disposition of cultural resources.

Our research orientation is referred to as the "landscape perspective." It assumes that human behavior is spatially continuous and can generally be inferred from the variability expressed by archaeological remains observable on the earth's surface (e.g., Foley 1981a). Furthermore, this perspective does not assume that the concept of "site" is without research and/or management value, and it does not advocate any particular theoretical model of past land-use (e.g., Jarman et al. 1972; SARG 1974; Tainter 1984). One of the many goals of the proposed research program is to determine experimentally which unit of documentation (e.g., the site, the survey unit, the artifact) is the most effective for describing certain kinds of cultural resources that are discovered under certain survey conditions.

In many respects, the landscape approach is a child of the frustration experienced by many archaeologists who have attempted to force the extensive variability of archaeological remains into ill-defined taxa. For example, a large lithic and sherd scatter is difficult to evaluate in a scheme that recognizes only habitation sites and limited-activity loci (Sullivan, this volume). In recent years, archaeologists have field-tested the landscape approach by developing methods that capture the regional distribution of archaeological remains. Thomas (1973, 1975) and Bettinger (1977), for instance, each generated models based on Great Basin ethnography that linked relative artifact density to suites of subsistence activities. Their discovery procedures were, by present standards, not very intensive (transect interval = 50 m) and the unit of provenience was a 500 m quad. Both archaeologists, however, inferred reliably that patterning in artifact density and dispersion was a result of past uses of differentiated landscapes.

Foley (1981a, 1981b, 1981c) constructed a model of regional artifact accumulation for the Amboseli region in Kenya. His discovery procedures were intensive and the unit of provenience was a relatively small 1000 sq m unit. An inventory of environmental features, such type of vegetation, soil, and lithology, was made for every survey unit whether artifacts were found there or not. The distribution of these landscape contextual variables enhanced the interpretation of spatial variation in artifact densities (see also Dancey 1973).

Irwin-Williams and her colleagues (1988) have devised a technique they term the Density-Dependent Method, which varies the nature and intensity of survey according to artifact abundance and clustering. The objective of this technique, which has been tested in central New Mexico, is to provide an accurate estimate of artifact density for each survey quadrat regardless of the distribution of artifacts within that unit. Another important component of their research involves collecting information about Landform Environment Classes (LECs), which are composites of topography, soil, and substrate, that they argue may have influenced past biotic diversity and productivity. LECs were interpreted from aerial photographs, and the analysis of artifact density and dispersion for each survey unit proceeded with respect to these landscape characteristics.

Another version of the landscape approach, called distributional archaeology (Ebert et al. 1987), involves the intensive survey, in-field description, and mapping of artifacts across relatively large expanses of land (between 0.16 h and 1.28 h). These field methods have been implemented in southwest Wyoming (Drager and Ireland 1986) and south-central New Mexico (Camilli 1988). Like Dancey's (1973) methods, they were designed to provide data on the association and covariance among different kinds of artifacts across a landscape. Aerial photograph interpretations, focusing primarily on geomorphology as a proxy for different potentials of past land-use, have framed some of these analyses (e.g., Ebert 1986; Wandsnider 1987).

These and other landscape studies share three attributes. First, all are explicitly concerned with the relationship between past land-use patterns and the present-day surface archaeological expressions of those patterns. Second, all focus on the problem of accurately and reliably measuring the density and spatial patterning of surface archaeological materials. In most cases, difficulties encountered in objectively and reliably documenting cultural materials using the site taxon prompted each of these researchers to abandon the site as the

unit of documentation. The unit of description is often the artifact and the unit of provenience may be the artifact itself or a parcel of land, such as the survey unit. Finally, all landscape studies employ environmental information, which may be obtained through a variety of methods (e.g., aerial photograph interpretation), to understand the presence/absence and regional patterning of cultural resources.

PRIORITY RESEARCH PROBLEMS

In view of the difficulties with current Forest Service cultural resource management procedures, three sets of research problems have been identified: (1) cultural resource discovery, (2) cultural resource characterization, and (3) natural resource discovery and characterization.

The first and highest priority set focuses on problems associated with the discovery of cultural resources. Contrary to the general Southwestern survey paradigm, which assumes high visibility, it is well known that throughout Region 3, cultural resources are often obscured by accumulations of leaf and needle litter or by alluvium. Related to the visibility problem is the question of how different survey (Schiffer et al. 1978) and sampling (Nance 1983) strategies affect the discovery of different kinds of cultural resources (Plog et al. 1978).

The second set of research issues is concerned with documenting the variability of cultural resources and their settings. Here, research is needed to evaluate different methods and techniques for characterizing cultural resources in an objective, non-arbitrary, and interpretation-neutral fashion. Results of this research would be especially useful in view of the difficulties presented by diffuse and expansive artifact scatters, which may be difficult to bound spatially using current techniques. Other problems in this set include (1) understanding how different factors affect the "renewal" of cultural resources once they have been observed or affected by the activities of archaeologists; (2) understanding how sub-surface archaeological variability is expressed differentially in surface archaeological variability (e.g., Synenki 1984); and (3) understanding the nature of the activities that produced small and/or low-density artifact scatters (e.g., Sullivan 1983, 1987a; Tainter 1979).

The third and lowest priority set of research problems focuses on methods and techniques for locating and recording features of the natural landscape that may have influenced the organization of past adaptive patterns and, therefore, the character of the regional archaeological record (e.g., Kohler and Parker 1986).

RESOURCE DISCOVERY

The probabilities for discovering cultural or natural resources vary depending on seasonal and spatial factors and on the physical and depositional characteristics of the material remains themselves. Our understanding of the processes that affect resource discovery probabilities, which is still emerging, has critical implications for both the interpretation and management of the regional resource base. Holding survey strategy constant, it can be assumed generally that the greatest chance of encountering cultural resources lies with material remains that are relatively large, abundant, dense, non-clustered, sharply contrastive with local vegetation, and perennially or frequently exposed (Schiffer et al. 1978). Conversely, remains that are comparatively small in area, rare, low-density, non-contrastive, and infrequently or poorly exposed have far fewer chances of being discovered.

Interestingly, research focusing on how environmental factors affect discovery probabilities has been relatively common in the Eastern Woodlands of the United States (e.g., Fish and Gresham n.d.; Krakker et al. 1983; Lightfoot 1986; Lovis 1976; Nance and Ball 1986). There, even abundant and clustered remains are frequently invisible to surface surveys because of heavy vegetation and substantial alluvial deposition. By contrast, variables affecting discovery probabilities in the Southwest have received almost no attention (cf. Schiffer and Wells 1982). Perhaps because the Southwest is viewed as an optimal situation for surface survey, reports rarely, if ever, specify any factors that could have limited the discovery of cultural resources.

A growing body of evidence, however, suggests that the prevailing Southwestern survey paradigm, with its assumptions of optimal visibility and exposed occupation surfaces, may be far too optimistic if not simplistic (Downum et al. 1986). Geomorphic maps of post-

Pleistocene land surfaces show broad expanses of deposition and erosion, even in zones outside major river valleys. Also, pine tree needles may obscure all but the most obtrusive remains in some forests, while dense grasslands present equally imposing challenges in others (Schiffer 1987).

Clearly, the landscape approach to understanding or modeling past land-use patterns requires that a familiarity be developed with those cultural resource phenomena that may depart from the theoretical construct of the site. This approach involves recording artifacts that may be so dispersed that they outstrip the spatial parameters for what has constituted a site but, which in the aggregate, represent related instances of an integrated behavioral complex. Such remains present difficulties in recording and analysis when our expectations of the regional archaeological record focus on the discovery of clustered artifact locations surrounded by empty space (Wobst 1983:66). Although the relatively sparse remains of hunting and gathering societies come immediately to mind (e.g., Thomas 1973), the problems of discovering and documenting the remains of those people who lived lightly upon the land are equally applicable to horticultural foragers (e.g., Sullivan 1987b) and extensive agriculturalists (e.g., Fish et al. 1985). It is essential, therefore, that experimental designs determine which survey scales, intensities, crew-spacings, and technologies (Calamia, this volume) may be the most effective for the discovery of remains representing different visibility thresholds (also Nance 1983).

CULTURAL RESOURCE DOCUMENTATION

Documentation of cultural resources is comprised of two complementary aspects: (1) description and (2) provenience. Description refers to recording pertinent attributes of the resource. Provenience refers to establishing locational information about the cultural resource.

Experiments should be designed to determine the efficacy of different descriptive methods at different levels of specificity and resolution. For example, artifacts can be classified in the field according to their major class, such as debitage, chipped stone tool, groundstone implement, and fire-altered rock (Button 1987). More comprehensive documentation might involve artifact collections and detailed laboratory analysis (e.g., Beck 1984).

Similarly, provenience information can be gathered at the scale of the survey unit (e.g., Bettinger 1977; Foley 1981b; Thomas 1973, 1975) or the artifact (e.g., Dancey 1973; Ebert et al. 1987; Camilli et al. 1987a). In some studies, the survey transect has served as the unit of provenience (Button 1987), while others have provenienced artifacts with respect to sites and non-site areas (e.g., Jones 1984).

The resolution level at which description and provenience data are collected is related to the level of effort expended in obtaining such data. Generally, as the level of resolution increases, so do costs. With the availability of microcomputer technology, however, the cost of high-resolution descriptive and provenience information has fallen dramatically (e.g., Camilli et al. 1987b) and should continue to fall. An important concern for Forest Service cultural resource research, therefore, would be to develop and test cost-effective means to acquire high resolution data regarding the following:

(1) objective and reliable criteria for establishing the spatial limits of cultural resources;

(2) variables and attribute states for describing how cultural resources are distributed across space; this may involve developing and testing a variety of recording formats and procedures;

(3) scales of provenience for documenting cultural resource locational information; this may involve exploring the efficacy of Geographic Information Systems (GIS) technology (Calamia, this volume; also see below);

(4) chronometric (e.g., obsidian hydration) and non-chronometric (e.g., seriation) dating techniques.

NATURAL RESOURCE DISCOVERY AND DOCUMENTATION

Important but often overlooked aspects of archaeological survey are observations that can be made by field personnel of the non-cultural components of landscapes. We recommend that

efforts be directed during surveys to locate and record the following potential sources of paleoenvironmental data (see also Dincauze 1987):

(1) Pollen Reservoirs: regional pollen records may enhance paleo-environmental reconstruction (Bryant and Holloway 1983); therefore, locations that are conducive to the preservation of pollen, such as dry caves and wet marshes, should be recorded.

(2) Packrat Middens: variability in the composition of packrat middens reflects local conditions because of the restricted foraging radii of packrats (e.g., Betancourt and Van Devender 1981); therefore, locations that are likely to contain packrat middens, such as crevices and rocky ledges, should be inspected for these remains.

(3) Dendrology: the analysis of cores taken from trees growing in stressful conditions often provides time-series data about past cycles of temperature and precipitation (e.g., Dean and Robinson 1978); therefore, locations of trees that appear promising in this regard should be noted.

(4) Lithic and Clay Sources: the nature and distribution of potential sources of raw material for stone tools, ceramics, and architecture should be recorded because they may provide data for studies concerning artifact manufacture locations, and trade and exchange patterns (e.g., Toll 1981).

(5) Stratigraphic Exposures: exposures of stratigraphic sequences, such as those revealed in roadcuts and arroyo cutbanks, should be recorded for geochronological studies. Of prime importance are those exposures that include buried soil horizons, lag deposits, and other features pertaining to soil development, erosion, and climatic change (Euler et al. 1979).

(6) Geomorphic Surfaces: information about the distribution of geomorphic surfaces provides a basis for determining environmental potential and the likelihood that artifacts of different time periods may be obscured from discovery by traditional survey techniques (e.g., Waters 1985).

Because Geographic Information Systems (GIS) store, organize, analyze, and display spatial data they can be especially useful for studying landscapes (Kvamme and Kohler 1986). Information about elevation, slope, aspect, relief, hydrography, soil associations, surface geologic units, and vegetation communities, for example, can be mapped and manipulated with GIS (Calamia, this volume). With these data, the covariation of archaeological and environmental variables can be explored.

When remote sensing techniques are interfaced with GIS, they become powerful tools for the interpretation and evaluation of landscapes, which may extend over hundreds or thousands of acres. One of the goals of landscape analysis is to identify specific spectral and spatial signatures that offer clues about land-use patterns (e.g., Weymouth 1986). Remote sensing techniques can facilitate this process by increasing the accessibility to specific landscape information. Also, temporal changes to a natural landscape resulting from biotic community dynamics, grazing, logging, and fires, can be analyzed and monitored.

Recent research has enabled specialists to identify plants by means of the nearly indestructible though minute quantities of diagnostic silicate minerals they produce (Rovner 1983). Variation among phytolith assemblages, as among pollen spectra, facilitates paleoenvironmental reconstruction. More importantly, opal phytoliths often survive for identification and analysis when pollen has not. Experiments in sampling for the remains of opal phytoliths should be conducted to test the feasibility of these data for contributing, in a cost-effective manner, to regional landscape studies.

CULTURAL RESOURCE RESEARCH AREAS

We propose that Cultural Resource Research Areas (CRRAs) be reserved as temporary research laboratories or research units where controlled experiments pertaining to the prioritized research problem sets can be conducted. Initial consideration should be given to Research Natural Areas, Wilderness Areas, and other special management areas that may already exist in order to reduce or avoid potential conflicts with other uses of forest

resources (e.g., recreation, timber sales). In all cases, however, the set-aside of these research reservations will be temporary (see below).

Areal parameters will be defined by the requirements of research designs, but maximal variability within and among CRRAs is an essential aspect of their definition. As a starting point, CRRAs could be based on Terrestrial Eco-System (TES) mapping units. TES units are 40 acre (or larger) parcels of land that are homogeneous with respect to soils and vegetation; a new TES is defined wherever soil or vegetation changes. For those forests where TES mapping units are unavailable, CRRAs could be based on major vegetation communities such as upland conifer forest, oak woodland, chaparral, or savannah grasslands (e.g., Brown 1982).

We advocate that a team approach, hopefully of a multi-agency nature, be developed to provide a clear organizational structure for the research program. Research partnerships, especially among sister land-holding and land-management agencies, will increase efficiency through the pooling of resources, the identification of common problems created by adjoining land-management responsibilities, and the sharing of knowledge and skills. Initial cooperative expression could be realized through the development of integrated research designs and planning schedules (see Upham et al., this volume).

At least two additional considerations suggest the need for closely involving Forest Service cultural resource specialists. First, while research problems may be broadly applicable, their most appropriate solutions will vary with the local expression of the archaeological record. Second, the CRRAs remain the management responsibility of the affected Forest. Thus, the Forest Archaeologist has the broad-based experience and knowledge to provide (1) the necessary contextual understanding of the nature of the resource base and (2) direction in the establishment of local research and management priorities.

Potential Selection Criteria

Based on the nature of the problems being investigated and the types of data they may warrant, some CRRAs could involve those areas of forests already reserved as Research Natural Areas and Wilderness Areas. Research requirements clearly affect CRRA size, environmental variability, and cultural resource variability. For example, a study of the effect of survey unit size on the discovery of cultural resources would necessitate a CRRA that could accommodate the largest-sized survey unit. On the other hand, studies designed to investigate the nature and extent of changes that occur when cultural resources have been modified by natural processes or by surface collection (the "surface renewal" problem) should be conducted in a variety of environmental communities. Here, a relatively large CRRA or a set of small ones could satisfy the design requirement of such a study.

Examination of available cultural resource records, including Forest Service computerized site survey data files, would assist in the design of experiments to solve particular problems. For example, experiments that focus on determining the relationship between surface and subsurface remains or that evaluate various means for detecting subsurface deposits could use previously recorded information about the nature and location of specific "target" cultural resources. Based on these data, suitable CRRAs could be identified for particular experiments because they have a high potential for disclosing appropriate cultural resources.

Economics

Many of the research problems will spawn field projects that could run concurrently. CRRAs that meet all of the needs of several experiments would be most economical because their withdrawal from multiple-use status would concentrate research-dedicated areas, thereby facilitating planning for other uses of forest resources. At the same time, one or several large CRRAs would be easier to than many small CRRAs. In part, this economy is realized when the cost of modifying and reviewing modifications of the Forest Plan is considered (see below). Also, access to many widely separated or distantly located CRRAs would undoubtedly be more costly than access to a few conveniently located ones.

Designation of CRRAs

CRRAs would be designated through the Land Management Planning process. All forests in Region 3 are now managed under terms stipulated in individual Forest Plans. Setting aside an area for study that is not currently being managed for essentially non-consumptive

uses would necessitate an amendment to the Land Management Plan. In the case of the CRRA, an area of a given size in a given management area and Ranger District would be proposed as the area of study. Should the proposal potentially restrict the use of a portion of the forest to groups or individuals (e.g., range permittees, timber companies), as designation of CRRAs almost certainly would, those groups or individuals would be included in negotiations from the proposal's inception. If agreement can be reached among all concerned parties, the proposal can be treated as an insignificant amendment to the Forest Plan and approved by the Forest Supervisor. If agreement cannot be reached, or if the amendment is appealed, the designation of the CRRA may have to be considered a significant amendment and an Environmental Impact Statement (EIS) prepared.

Scheduling and Duration

We propose that CRRAs be dedicated experimental sites for at least five years. Thereafter, a few long-term projects might continue for an additional five to ten years on CRRAs that could be, depending on experimental results, reduced in size. The majority of CRRAs, however, could be withdrawn from dedicated research status and made available for other Forest uses after a minimum period of five years. The following implementation schedule is proposed:

Year 1 - **Organize partnerships** to develop research designs, operationalize problem domains, identify key personnel, and compile available data.
- **Select CRRAs** on the basis of research design requirements.

Years 2 through 4 - **Implement research** through data collection, compilation, and analysis.

Year 5 - **Report** and disseminate experimental findings and make recommendations to the Forest Service.

In view of the prioritized research problems enumerated above and the proposed implementation of research activities, at least three alternative scheduling modes or "scenarios" should be considered:

(A) Priority #1 Priority #2 Priority #3
!--------->! !--------->! !--------->!

(B) Priority #1
!--------->!

Priority #2
!--------->!

Priority #3
!--------->!

(C) Priority #1
!--------->!

Priority #2
!--------->!

Priority #3
!--------->!

RESEARCH ORGANIZATION

In executing the proposed research program, a partnership approach would improve long-term effectiveness and coordination. Such partnerships might be arranged among land-managing agencies, especially where lands are contiguous and management needs are similar. Individuals and groups representing the private sector could be encouraged to provide funds or services for research that are appropriate to their interests. University or museum partnerships, built perhaps on the National Park Service Cooperative Park Service Unit (CPSU) model, would be especially important in providing a broad range of skills, knowledge, and experience to the research program. In such partnerships, cooperative planning, resource pooling, and information sharing would contribute to increased research effectiveness.

In promoting and structuring these partnerships for planning and executing the proposed research, the Forest Service should be fairly aggressive in assuming a lead role. Potential partners should be "sold" on the advantages of comparable and reliable information for management, and on the concept that cooperative arrangements produce good value for the investment. Along these lines, some effort should also be directed toward minimizing interagency administrative and regulatory redundancies, and generally smoothing the bureaucratic path for cooperative archaeological research activities.

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The Need for an Integrated Approach in the Use of Automated Information Systems for Archeological Predictive Modeling[1]

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Abstract.--The use of computerized information systems for cultural resource management has great potential when used in an integrated fashion. Specifically, data base management systems, geographic information systems, remote sensing techniques, and exploratory data analysis methods, when used in concert, provide a powerful package of analytical tools useful in predictive modeling studies.

To manage cultural resources effectively for large parcels of land, the U.S.Forest Service requires the ability to control, access, and manipulate appropriate classes of data. In addition, these data need to be consolidated for forest management planning. Forest Service managers need access to information concerning the current status of cultural resources and any activities that could affect this status.

In many forests, cultural resource studies have contributed a substantial quantity of data about the nature and distribution of cultural resources. With the accumulation of large data sets, it becomes increasingly difficult to properly maintain, control, and evaluate these data using manual methods.

The accumulated data include descriptive information on archeological properties such as cultural/temporal affiliation, assemblages, environmental context, provenience, and management recommendations. Another type of accumulating data involves information pertaining to the location of cultural resource inventories, defining areas which have been searched for sites, and survey intensity. Areas where sites occur, as well as where they do not occur, are found in this type of information. The environmental data class is yet another major source of accumulating information which most forests have easy access to. Finally, there is forest management and administrative information relating to current and projected undertakings such as timber sales or land development and construction projects.

A study performed for USFS Region 8 (Parker et al. 1986) noted that several needs must be met to enhance the overall quality of cultural resource data. These include: (1)improved control of and access to inventory data; (2)a data base designed for the merging of these data with survey and environmental data for use in predictive models; and (3)use of Geographic Information Systems (GIS) technology for analysis and display of environmental and cultural resource information to build predictive models.

This paper focuses on the use of automated information systems and analytical techniques for satisfying these needs. This approach was first espoused by the Arkansas Archeological Survey (Parker et al. 1986; Limp et al. 1987; Limp 1987a; Farley 1987). Much of the information presented in this paper has been summarized from their work and others.

First, a general discussion is presented of the complex nature of cultural resources, which necessitates the use of sophisticated techniques for understanding their patterning and relationships. The next section examines the use of four types of automated information systems and techniques which are proving useful for settlement pattern analysis, predictive modeling, and site discovery. These automated systems include data base management, geographic information systems, remote sensing imagery, and exploratory data analysis (Limp 1987a). Next, a rationale is presented for the use of computerized systems for meeting managerial and research needs. Finally, conclusions are drawn which point to the need to use integrated technologies for predictive modeling to satisfy Forest Service management and research requirements.

Automated Information System Needs

In order for the management of land resources to be successful, the distribution of and interrelationships among natural and cultural resources, and the manner in which these change through time and space, need to be understood. This is made possible through the discovery of regularities or patterns in multidimensional relationships. The process whereby meaningful patterns are recognized in complex data sets is greatly facilitated by the use of automated information systems.

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The distribution of archeological resources is the result of the interaction of a variety of natural and cultural variables. As such, the data can only be examined properly in a multivariate framework. Basic requirements for such an approach are to maintain a diverse variety of data relationships in an accessible and easily controlled format, and the capability to manipulate and quantify these associations to produce useful results. Automated information systems when used in concert to meet these requirements include data base management (Martin 1977, 1983), geographic information systems analysis (Berry 1986), remote sensing imagery analysis (Limp 1987a), and exploratory data analysis (Chambers et al. 1983).

Although these tools have been used successfully in various analytical efforts, these have usually focused on the use of a single form of automated system (Parker et al. 1985, Kvamme 1985a, 1985b). A recommendation will be made below for a structured program of analysis in which the individual technologies are used in a complementary way so as to be useful for predictive modeling. In this manner, it will be possible to increase our understanding of the nature, distribution, and significance of the resource base.

Four Types of Automated Information Systems and Techniques Useful for Cultural Resource Management

These systems are structured in such a manner as to assist in the organization of information while keeping data in a format which allows for quick retrieval and use. Types of DBM systems include network, hierarchical, and relational models. Each of these has its advantages and disadvantages (Parker et al. 1985: 100-107; Limp et al. 1987:19-24). All data base management systems, however, have certain attributes in common, (Farley 1987):

1. mechanisms for data entry and retrieval;
2. information storage in nominal, ordinal, and interval scales, and alphanumeric text-based data;
3. capabilities of associating diverse information through the use of keys or pointers;
4. limited quantatative capabilities; and
5. capability to import and export data through a universal format like ASCII.

These systems usually do not prove useful for managing multidimensional data, such as that required for predictive modeling, when the logical interlinkages are not known or evident. However, a DBM system which can aid in solving several closely related problems is better suited for revealing potential patterns or anomalies between data sets. A relational-type data base structure is considered best for managing multivariate data which must be linked and accessed in a variety of ways. This structure consists of a series of two-dimensional tables where each record (row) contains all the attributes or variables associated with a single object or event and each column is a group of data values relevant to a single object, event, or place. The records among different tables or files are linked to each other through the use of common identifiers which appear on each record (Parker et al. 1985:108-110). In this way, the relationships between records can be specified at retrieval time. This is accomplished by matching attribute values between different files. Thus, related records can be easily found.

Parker et al. (1985:94) have recommended that a "top-down theoretical orientation" be employed when designing DBM systems for archeological applications. In this type of approach the variables and associated relationships relevant to a specific research problem can be thoroughly defined and modeled prior to any program development.

Items about which data can be collected have been termed entities and the properties of entities which define them consist of attributes, variables, or data categories (Parker et al. 1985). For successful cultural resource management applications, a DBM system must include three entity types: (1)the archeological site; (2)cultural resource investigation; and (3)bibliographic citation. The archeological site entity should contain a variety of attributes dealing with site identification and locational information, description or technical data, managerial considerations, environmental factors, and notes. The cultural resource investigation entity must contain attribute information on the inventories themselves and notes. Finally, the bibliographic citation entity requires identification, content, and note attributes. The attributes themselves and their organization and manipulation for predictive modeling are beyond the scope of this paper. (See Parker et al. [1986] or Limp [1987a] for a full discussion of this process).

Data base management systems can provide accurate inventory information of existing cultural resource properties and some limited data on various environmental variables, e.g., soil associations or topographic position (Hillard and Riggs 1986). However, they do not have the capability to retain information on non-sites (those locations which do not contain archeological properties). In addition, they cannot maintain detailed data in a format that can be easily used to identify those dimensions or combinations of dimensions within the natural environment that may have influenced the locating of sites in particular areas (Farley 1987). Thus, data base technology alone cannot answer questions such as, "did groups having a farming economy always locate themselves in proximity to arable and and water or did elevation, slope, and vegetation play an important part in the settlement patterns of hunting and gathering peoples in a specific region?"

Questions such as these require the accumulation of extensive environmental information. This modeling requires the examination of multivariate data so as to understand the association between the presence or absence of archaeological properties and the co-occurrence of one or more dimensions of the natural environment. For example, how many sites are located on geologic surface unit x, or what is the relative density of artifacts situated on south-facing slopes within 200 meters of third order streams? Information of this type can be used for making predictive

statements which can potentially aid in explaining the mechanisms responsible for site location. At the same time, this information allows managers to direct ground-level surveys to those areas which are more likely to contain sites. One special type of database management system capable of generating information useful for modeling is a geographic information system.

Geographic Information Systems (GIS)

A geographic information system is a computer-based means for assembling, organizing, analyzing, storing, and displaying varied forms of data corresponding to specific geographical areas, with the spatial locations forming the basis of the system (Hansen 1983; Tomlinson 1984). Almost all types of geographically distributed information may be encoded in an automated-compatible form. Automated systems can extract geographic information from digital geographic databases, manipulate the data, derive new data, and perform analysis in a number of research and management contexts. Thus, GIS can be used in the analysis, interpretation, and problem- solving aspects of research of spatiallyoriented phenomena and processes.

These systems add a spatial dimension to data stored from USGS 7.5 minute or 15 minute quadrangles. This information is stored in a series of separate layers or themes which can be examined, manipulated, or compared quantitatively using a variety of methods. To illustrate, a GIS might contain data layers for archeological surveys (polygon data), archeological sites (point data), road networks and hydrology (vector data), surface geology or soils associations (polygon data), and elevation (vector). When these data are properly formatted, the GIS can rapidly identified points or areas which have common sets of attribute values. GIS technology depends heavily on the visual transmission of data through sophisticated graphic images to summarize univariate, bivariate, and multivariate distributions across space in the form of a displayed map. This capabiltiy allows the archeologist rapidly to explore a number of relationships which might otherwise go unnoticed. In addition, a cell-based GIS (see below) is uniquely suited to applications directed towards quantitative analysis and the development of predictive statements (Kvamme 1985a, 1985b, 1986). Using a GIS, many reports, coincidence tabulations, simple statistics, and proximity types of analysis can be conducted, thereby creating the basis for more sophisticated quantitative techniques.

There are two (basic) types of GIS: cellbased and vector-based. In a cell-based GIS, also called raster-based, the area of examination is subdivided into a regular grid of rectangles. These cells, generally squares of equal area, are contiguous. Data are recorded by overlaying this grid of cells on maps of the area and recording a series of data values for each cell. In a vector-based GIS, the maps of the area are encoded as a series of points, lines, and polygons representing respectively, point features (such as small archaeological sites), linear features (such as roads or streams), and area features (such as soil types or lakes). The lines and polygons are represented as a series of lines joining points whose coordinates are recorded. The advantages and disadvantages of both of these types of GIS are discussed elsewhere (Kvamme 1985b; Parker et al. 1986). For purposes of predictive modeling, cellbased GIS must be used (Kvamme 1985a, 1985b, 1986).

The GIS requires a variety of hardware and software components. Other than standard computer elements, typical GIS hardware includes the following equipment (Parker et al. 1986; Dangermond 1983):

1. Digitizer: An optical or electromechanical device used to convert map information to digital x-y coordinates suitable for computer processing.
2. Storage Devices: Relatively large hard disk systems and tape drives are necessary because geographic information requires considerable storage space.
3. Graphics Display Devices: Results of the GIS analysis are best presented in multicolor output devices. In general, both a cathode ray tube (CRT) and some form of hard copy output device are necessary.

GIS software requires these basic elements:

1. Map Development: Specialized software is needed to transform raw digitized input into useful GIS data functions and includes such capabilities as data editing and mathematical transformation. The software must be able to georeference data correctly and to register multiple data layers. Georeferencing means that correct location information is associated with the computer data. Registration means that locations in each map layer occur in the same correct relationships to each other from map layer to map layer.
2. Data Retrieval and Analysis: Various modules are required to allow the analysis of the data. Important capabilities include combining information from two or more map layers into a new, third map and comparing the distribution of values in one map layer to another.
3. Display: Special software is needed to convert the results of the retrieval and analysis to a form which can be presented on the display devices.

Parker et al. (1986) have recommended a set of GIS functions or commands which should be considered for cultural resource management. These functions are shown in table 1., Item 1-31 and 38-40 characterize a good GIS (American Farm Trust 1985; Tomlinson and Boyle 1981). Items 32-37 are quantitative functions necessary for effective predictive modeling (Kvamme 1985a, 1985b; Kohler and Parker 1986). Items 32-36 may be obtained internally in some GIS or externally by means of exporting the data to a statistical software package, such as SPSS, in a format compatible to the software (item 37). For purposes of predictive modeling analysis, the GIS must be capable of exporting data in tuples. That is to say, for any given set of cell locations, the data present in each comparable cell in each map theme should be output. Once the data are organized in this manner,

Table 1.--GIS functions useful for cultural resource management.

Data Entry

(1) Entry of raster (grid cell) data via digitizer
(2) Use standard data sources/formats
  a. USGM DEM
  b. DMA DEM
  c. USGS DLG
  d. MSS/TM Band sequential imagery
  e. MSS/TM Band interleaved imagery
  f. Arc-node
(3) Georeference data not already in coordinate system
(4) Register map data to standard coordinate systems
  a. UTM
  b. State Plane Coordinates
  c. Lat/Long
  d. Other projections
(5) Scanner input with automatic polygon and/or arc-node generation

Editing/Updating

(6) Automatic error detection/node snapping
(7) Interactive editing/updating of data
(8) Edge matching

Data Retrieval and Analysis

(9) Convert polygon/arc-node data to raster
(10) Sort attributes based on value
(11) Locate attributes in specific geographic area
(12) Detect edges
(13) Calculate distance from point to point
(14) Calculate distance along linear feature
(15) Summarize attributes by cell
(16) Compute statistics by collection of cells
(17) Compute statistics by interactively entered area
(18) Conduct nearest neighbor search
(19) Conduct proximity search
(20) Summarize points within area/polygon
(21) Calculate slope from DEM
(22) Calculate aspect from DEM
(23) Define watershed boundaries from DEM
(24) Selectively assign weights to categories
(25) Compute number of acres/other units within a specified area
(26) Change size of grid cells
(27) Perform map layer coincidence
(28) Perform map layer exclusion
(29) Perform map layer union
(30) Perform map layer multiple excusion
(31) Perform map layer multiple weighting

Statistical/Quantitative Analyses

(32) Calculate means/mode and standard deviation for map layer or subsets
(33) Cross tabulations
(34) Chi-square expected vs observed
(35) Linear/logistic regression
(36) Classification (parallel-piped maximum likelihood, etc.)
(37) Output tuple data for multiple map layers in exportable format for input to statistical software

Display

(38) Output hardcopy at field usable scale (i.e. 1:24000, 1:12500)
(39) Output hardcopy at variety of scales with automatic pruning
(40) Output cartographic quality materials

Source: Parker et al. 1986

a large variety of sophisticated statistical operations can be initiated. It should be noted that spatial autocorrelation should be taken into account in such analysis (Rose and Altschul 1986).

Many varieties of GIS data are available from several federal and state agencies in digital form. Some data such as USGS Digital Elevation Models or Digital Line Graphs are usually already georeferenced. Other data such as soil associations or archeological surveys may have to be digitized from maps or mylar overlays.

A number of data layers or themes can be useful for predictive modeling. The data are in primary and secondary (derived) layers. Elevation is an example of a primary layer, while both slope and aspect can be derived from the elevation data by special operations. These are considered secondary layers. Other examples of primary layers relevant to a cultural resources GIS might include stream locations, distance to streams, surface geology, physiography, vegetation, location of archeological site types, areas of archeological survey, road locations, distance to roads, ranger district boundaries, planning unit boundaries, compartment boundaries, and stand boundaries (Parker et al. 1986; Kvamme 1985b).

An important point to bear in mind is that most of the environmental and administrative data needed for predictive modeling studies are the same data used by many other Forest Service specialties. Thus, only the cultural resource site and survey layers need to be obtained for implementation of a cultural resources GIS. The scale or resolution of the data needed, which includes cell size among other considerations, is beyond the scope of this presentation (See Kvamme 1985b; Parker et al. 1986; and Limp et al. 1987 for details on cell size selection).

The cost of a GIS system varies depending upon the level of sophistication and storage capacity. In addition, hardware and software specifications and costs change rapidly. Several common GIS costs are compared in table 2. These are only suggested costs and reasonable estimates as of 1986. The estimates assume that the complete system is purchased.

There are five separate stages associated with the development of a GIS data base for predictive modeling. These include variable identification and classification, identification of data sources, map preparation, data acquisition, and data editing and cleaning. For each stage, several cost-benefit decisions must be made using fiscal and technological criteria as related to the

Table 2.--System costs (In thousands of dollars).

ERDAS	
IBM PC AT with hard disk and tape system	
Plotter	
Digitizer	
Graphics boards and display	
	25 - 50
Software	20 - 50
System Total	40 - 100
MOSS/MAPS	
Data General MV 4000	
Plotter	
Graphic display	
Digitizer	
	80 - 100
Software	0 - 0
System Total	80 - 100
GRASS	
MASSCOMP 5000 Series	
Plotter	
Graphic Display	
Digitizer	
	50 - 100
Software	0 - 0
System Total	50 - 100
ARC/INFO	
Data General 4000	
Plotter	
Graphics Display	
Digitizer	
	80 - 100
Software	75 - 150
System Total	155 - 250

Source: Parker et al. 1986

anticipated requirements of the GIS. (See Parker et al. 1986:135-158 for an excellent discussion of these database development stages.)

Remote Sensing Imagery (RSI)

Remote sensing involves the acquisition of data about physical objects and the environment through a systematic process of recording, measuring, and interpreting photographic images and patterns of electromagnetic radiant energy. Common remote sensing methods are photographic, aerial and ground based photography, and airborne or satellite multispectral scanner products. Archeologists have made use of these methods in a variety of applications designed for locational analysis and prediction. (See Ebert [1986] for an overview of archeological studies involving remote sensing methods).

Archeologists who have used remote sensing methods for predictive modeling agree that much work is still to be done if remote sensing imagery is to be effectively used in archeological research and management. The majority of the earlier studies focused on the application of digital image processing to archeological site discovery. Today, more fundamental questions have been raised regarding what we expect the spectral and spatial properties or signatures of archeological remains to be. The methods used to evaluate such techniques need to be considered with respect to this information. The physical properties of sites and their spectral consequences are currently the focus of remote sensing studies involving the use of multispectral scanners. It should be remembered that archeological sites may be extremely difficult to classify using multispectral imagery. In addition, even within a given site there may be significant variability (Limp 1987a).

Multispectral scanners record reflected and/or emitted radiation in the ultraviolet, visible, infarared, and microwave bands of the electromagnetic spectrum. For sensors to identify successfully archeological sites, one or more physical properties must be present that emit or reflect measurable radiation that can quantitatively be discriminated from radiation of non-archeological locations. Limp notes that, "...this discrimination may result from unique spectral properties of archeological sites or to the contrast between the archeological site and its setting, either in spectral character or spatial patterning." (Limp 1987a)

Physical properties present at some archeological sites may include phosphateenriched soils, organically-enriched soils, differential soil compaction, micro- and macro-relief variation, and regularity in edges or patterning in soil/vegetation. However, these properties are not usually directly detectable by multispectral scanners. Instead, a set of "proxy" biophysical properties which are closely interlinked with these physical properties are potentially capable of measurement with appropriate multispectral scanners. These "proxy" biophysical properties may include soil temperature, vegetation type, vegetation vigor, and moisture retention (Limp 1987a). Obviously, certain vegetative settings in forests will be more amenable to this type of analysis than others.

As alluded to above, more accurate classification is required for accurately locating sites. But even if it is highly accurate, remote-sensing imagery alone can only aid in locating sites. In terms of research and management, it is essential to increase our understanding of the processes which generated the observed patterns. In order to improve our accuracy and to address processual issues, remotely-sensed information needs to be integrated into a comprehensive automated data processing environment. This environment should include alphanumeric attribute information on archeological sites, surveys, and projects, cultural resource spatial and environmental data in a geographic information system, and software for exploratory data analysis (EDA) to assist in ascertaining complex multivariate patterning. Researchers including Sever (1983), Ingles et al. (1984), Kvamme (1985a), and Lafferty et al. (1981), have

suggested that remotely sensed data could best be used in a GIS environment. Some archeological investigations have successfully utilized remote sensed imagery in a GIS context (Wells et al. 1981; Custer et al. 1983, 1984, 1986; Holmer 1986, Limp 1987b). Effective digitizing options, useful cell sizes, and digital data sources were among the essential requirements for these studies. Hardware components must also be capable of handling large data files and producing high resolution diplays.

Recent work by such groups as the Construction Engineering Research Laboratory, the Space Remote Sensing Center, the University of Washington Statistical Laboratory, the MASSCOMP Corporation, and the Arkansas Archeological Survey have led to the development of an integrated system which is widely available at relatively low cost. (See Limp 1987a; Limp et al. 1987 for details on the structure of this system.)

Exploratory Data Analysis (EDA)

Data bases and geographic information systems are capable of providing qualitative and quantitative information on the character and spatial distribution of resources. However, most of these systems do not possess the functions necessary rigorously to investigate the underlying distribution of the raw data. In addition, they lack the sophistication necessary to examine these distributions so that basic assumptions of complex statistical methods are not violated. EDA software must be used to meet these requirements.

EDA increases our understanding of the distribution of individual variables and the multivariate relationships which may exist between variables. This is made possible through the use of boxplots, histograms, crossplots, scattergrams, etc. In this manner, it is possible to ascertain better whether or not the data conform to the distributional assumptions of more robust statistical methods. As suggested above, the data from DBM systems can be integrated with the data from a GIS and/or with remotelysensed digital data, with the resulting information examined using EDA techniques. These EDA techniques are available at a relatively low cost in the form of various statistical packages or "canned" programs (Limp et al. 1987; Limp 1987a; Parker et al. 1986; Farley 1987).

A Rationale for the Use of Computerized Systems for Cultural Resource Management

The Forest Service is now engaged in the performance of many intensive archeological surveys for roads, timber cuts, land sales, and other projects. Because of this inventory work, a substantial corpus of site and non-site data is becoming available. What is currently lacking in many forests is the capability easily to access these data and combine them with environmental data for particular areas of need.

In the past, potentially useful environmental data have been available from a variety of data sources, usually in the form of maps. However, these sources do not allow for easy comparisons with cultural resource data. In particular, they do not permit the necessary multivariate considerations of two or more data sources necessary for predictive modeling.

As shown in this paper, computerized systems are now available that have the multivariate capabilities to manipulate and analyze complex spatial data. Geographic Information Systems, in particular, are similar to other automated DBM systems in that they present a generalized, automated structure for the entry, storage, and retrieval of geographic data. Although they are similar to other DBM systems, they are made more complex by the added spatial component of the data and by substantial size (Calkins 1984). Another major difference is that GIS data bases require large investments of time for data acquisition in order thoroughly to represent the biophysical characteristics of particular areas.

In 1985, Tomlinson Associates, Inc. initiated a workload and functional analysis to ascertain which information products would be most useful for Forest Service managers. They also identified the data requirements for producing these products (Tomlinson Associates, Inc. 1985; n.d.). The intention of the Forest Service, in time, is to create Forest-level digital geographical data bases of its natural resource data in a form that will allow for easy updating, the performance of various digital analyses, and the generation of results to assist Forest managers in land administration.

From this study, Tomlinson Associates, Inc. was able to determine the present and nearterm information needed for effective management of the land base and its natural resources within a specified field unit. The results describe the spatial data handling processes and workload over time to produce information products required by forest resource managers to effect daily management decisions. As far as technological requirements were concerned, they identified archeological distribution and prediction maps and lists of cultural resources as the information products required. These data products are needed to answer questions concerning the prediction of likely locations for prehistoric sites, the determination of historical settlement patterns, and the general pattern of artifact density.

Accessibility to various forms of environmental data has increased substantially in recent years through the development of digitized data from various state and federal sources, e.g., Soil Conservation Service, USGS, and land and survey offices. Table 3 shows the suite of environmental data now available in digital format. With the use of geo-based software, these data sets can now be merged with archeological site and survey data to produce predictive models which are useful in planning for general land management or for specific projects.

Conclusions

As mentioned above, the leading proponent for the integration of the various automated techniques for cultural resource management on public lands is the Arkansas Archeological Survey (Parker et al. 1986, Limp et al. 1987). The views presented here

Table 3.--Data sources for developing a cultural resource management GIS.

Category	Source	Type	Resolution	Scale
Elevation	Defense Mapping Agency Aerospace Center	Raster	90 m	1:200,000
	National Cartographic Information Center	Raster	30 m	1:24,000
Landuse/Landcover	National Cartographic Information Center	Vector	NA	1:100,000
		Vector	NA	1:250,000
		Raster	200 m	NA
Political/Census Boundaries	National Cartographic Information Center	Vector	NA	1:24,000
		Vector	NA	1:100,000
		Vector	NA	1:250,000
	Bureau of Census	Variable	NA	1:24,000
		Variable	NA	1:100,000
		Variable	NA	1:1,000,000
Hydrologic Units (Watershed)	National Cartographic Information Center	Vector	NA	1:100,000
		Vector	NA	1:250,000
		Raster	200 m	NA
Transportation	National Cartographic Information Center	Vector	NA	1:24,000
		Vector	NA	1:100,000
		Vector	NA	1:200,000
Hydrographic (Streams and Waterbodies)	National Cartographic Information Center	Vector	NA	1:24,000
		Vector	NA	1:100,000
		Vector	NA	1:200,000
Soils	Soil Conservation Service	Vector	NA	1:24,000
		Raster	4 hectare cells	NA
Geology	National Cartographic Data Center	Variable	NA	Varied
Satellite Imagery	SPOT Image Corp.	Raster	10 m (panchromatic)	NA
		Raster	20 m (panchromatic)	NA
	Earth Observation Satellite Co. (EROSAT)	Raster	80 m (MSS, RBV)	NA
		Raster	30 m (TM)	NA
MSS Airborn	Environmental Protection Agency	Raster	Variable (MSS)	NA
	National Space Technology Laboratory	Raster	Variable (MSS)	NA

Source: Johnson and Goran 1985

are based largely on their observations and recommendations in using the various technologies discussed for predictive modeling applications. The Arkansas Archeological Survey studies have utilized the integration of several types of computerized data bases for archeological investigations.

Automated information systems are suited to meeting the needs of short-term projects, long-range planning efforts, and the scientific investigation of various cultural resource phenomena. Problem-solving is usually associated with short-term management in which managers try to achieve a particular goal while remaining in compliance. In the case of Forest management, a project such as road construction needs to be completed or a logging area needs to be identified and used, and a Forest manager simply wants to resolve the problems as expeditiously as possible. The implementation of a structured automated program involving data acquisition, organization, and analysis will provide Forest managers with the information needed to make informed decisions for program implementation. Through time the models produced by such a structured program will become more refined with the accumulation of additional data, thereby insuring that the process will become more efficient and useful.

Once predictive models are developed and subsequent iterative refinements are made of the modeling process itself, an environment conducive to a structured automated program for cultural resource management can develop. Farley (1987) points out that once the initial models are developed, they can serve as the basis for a long term planning strategy. This strategy can be developed as a guide to projecting the nature, density, and distribution of resources likely to be present in land areas of varying sizes and shapes. A potential benefit of such planning is refinement in estimates of inventory costs, personnel needs, and schedules. Another benefit is the ability to perform planning specifically related to cultural resources. Because this integrated structured program involves the use of DBM, GIS, RSI, and EDA, a requirement exists for the systematic collection and analysis of data to develop a standardized body ofinformation. In this manner a comparative basis for resource information is created. This, in turn, enables the development of rationale criteria for implementing preservation measures.

Finally, the application of an integrated information system program to the management of cultural resources greatly aids in the building of models necessary for the explanation of various archeological phenomena such as settlement patterns, land use, and adaptive strategies. Because these automated tools help to increase our understanding of the underlying processes responsible for that distribution, the ability to focus on research problems is enhanced.

It should be remembered that a technology cannot be a solution to all resource management problems; however, by effectively integrating "high tech" tools for predictive modeling, the Forest Service can only enhance the management and appreciation of its cultural resources.

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(The remainder of Mark Calamia's literature citations appear on page 214.)

Cultural Resources on National Forests: New Products for New Markets[1]

Linda B. Kelley[2]

Until recently, cultural resources interpretation on national forests has received little attention. Theoretical and methodological issues and concerns are outlined and a creative approach to cultural resources interpretation, framed within marketing concepts, is proposed. A recurrent theme is that the public to be served must be understood in order to produce a quality product.

INTRODUCTION

Cultural resources managers on national forests are responsible not only for the material remains of this nation's heritage, but for the oral traditions associated with it as well. We have a heritage to tell. Our success is dependent upon leadership aimed at strengthening our public presence and reinforcing heritage values through creative interpretive efforts.

Cultural resources, the material remains of past human activity, are significant to our national heritage for the knowledge they provide of the past regarding behavior and interactions as integral parts of changing cultural and natural systems. They also provide such indirect benefits as education, training, public enjoyment and economic enhancement opportunities.

Our national heritage is recovered and interpreted through the process of archeology. Professional archeologists have suggested that archeology provides a closeness to one's past and present, its techniques are fascinating, and the act of discovery stimulates a vicarious experience (Fritz 1973). Additionally, it is said (MacLeod 1977) to be a public recreational resource, an artistic adventure, a detective mystery, and a focus of thousands of human needs and interests.

In spite of these projected social and individual values, public opinion regarding archeology, and therefore, cultural resources, is mixed. For instance, the public believes the money it has invested has yielded little in return. Consequently, the archeologist has been popularized as a slightly anachronistic, doddering pith-helmeted, bearded professor, someone who serves as an intermediary between the quick and the dead (Fritz 1973; Sanday 1976), or, recently, as a swash-buckling adventurer. Such mixed opinions are attributable to an apparent lack of opportunities for public participation in the archeological process. One means of affecting participatory opportunities is effective cultural resources interpretation which not only informs, but also imparts to the general public its projected values.

In developing a concept of what constitutes effective cultural resources interpretation, elements from marketing have been employed. Marketing provides a framework in which interpretation may be designed in terms of its product, place, promotion, and price. Products, defined by their purpose and developed to provide a satisfactory experience, will be discussed in this paper. The objective is the creation of interpretive products which will foster public cooperation, our first line of defense in the conservation of this nation's heritage.

CULTURAL RESOURCES PRODUCTS

It has been argued (Gumperz 1976) that participation in any decision-making process that affects the quality of life is required by modern society, and that opening communication channels is is an important factor in maintaining quality and continuity in urban life. A communication crisis, characterized as a widespread misunderstanding, has been identified in archeology. One reason for this misunderstanding is failure on the part of professionals to recognize that heritage and history are not conceptual vehicles; the public cannot identify an event unless they are at the place where the event occurred. At the same time, the public has become more aware of cultural resources as the result of population growth and its encroachment on sites, and increased leisure time and its attendant travel.

Alleviation of this misunderstanding by

[1]Paper presented at the Forest Service Cultural Resources Research Symposium [Grand Canyon, May 1-6, 1988].

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opening communication channels has been frequently discussed during the past several years. At first, the focus was on educating the profession in the need to communicate with the public, based on the assumption that without effective communication it is not possible to influence a person's ideas or his approach to a subject. While positively influencing opinion remains a primary concern, the current focus is on educating the public through responsible communication of our cultural heritage by every possible means (Gumerman 1982).

One process by which responsible communication can be accomplished is cultural resources interpretation. This process is complex, beginning with the attempt to understand the public being served. In particular, those being served must be accepted as a source of information, and their experiences and idiosyncracies must be considered.

That portion of the general public with which we are concerned is user populations comprised primarily of national forest recreationists. These users choose activities which are consistent with their basic outlook on resources, the environment, and quality of life (Jackson 1986). The satisfaction they derive from recreation activities depends on the uniqueness of the experience, their expectations, and practical matters such as distance and accessibility.

Forest recreationists can be further segmented by number and type of users, use patterns, site preferences, and user characteristics. User characteristics which define especially meaningful segments are quantifiable differences in age, education level, interest, and goals to be achieved in recreational activities. One segment identifiable through analysis of use patterns is non-users. Barriers to use require further research, but socioeconomic factors and individual perceptions (e.g., is it for me?) particularly warrant consideration in the design of interpretive products.

Evaluation of the potential for use of specific resources by any population segment aids in the identification of marketing targets, those users and needs for which cultural resources interpretive products can be designed, promoted, and delivered. Throughout product development, it is important to recognize that users generally participate as members of social groups, and that such groups significantly influence individual values, attitudes, preferences, and perceptions. Indeed, the potential for the social group to function as an effective transmitter of interpretive messages should be used to advantage (Field and Wagar 1984).

The Setting

Within museum philosophy, the setting in which interpretation occurs is conceived of as a stage (Grinder and McCoy 1985); the production presented thereon allows the public freedom of movement, thought, and timing to interpret in its own terms the representations made. Cultural resources settings can also be conceived of as stages; consequently, some attributes of such settings may be derived from theatrical contexts, including size, visibility, line, color, costume, and script.[3] Additional attributes of cultural resources settings are site history, who the archeologists are and the nature of their work, and who is making the presentation. In a successful performance, all of these attributes are functionally arranged to focus attention and to complement basic elements of good public presentation, including communication (the relationship between individuals), being in role, and caring about the audience.[3]

Development of an awareness of audience/user needs is a critical element in the creation of a setting in which public presentations of cultural resources interpretation occurs, as well as being essential in the design of quality interpretive products. Three specific needs that a setting must satisfy are those for reverence, education, and association. These are expanded to mean a personal experience with something out of the ordinary, a place to interpret the world and to incorporate events into a search for life's meaning, and a place to socialize (Adams 1983).

Associational or social needs are self-explanatory. These will be easy to provide once user preferences regarding places have been determined. Reverential needs (experiences) are best met when a link between the public and the information being presented has been created. Several interpretive products are used to create this linkage; these are subsumed under the term "script" in this paper.

Research is necessary in order to define educational needs and to identify segments for which interpretive products may be designed. For instance, it has been observed by the tourism industry that providing educational experiences for children is currently a prime concern in vacation planning. Pending further study, it is worth suggesting that past interpretive efforts undertaken in cultural resources settings have often not produced a satisfactory experience.

Traditional functional interpretations, especially of material remains, have been cited (Frese 1960) as being at fault; they imply a realism which does not coincide with the reality of cultural resources in their original context. Consequently, a sense of neutrality is produced and any living qualities in the cultural resources setting are extinguished. To alleviate problems resulting from this neutrality, to rekindle living qualities, and to facilitate educational needs, interpretive products should be designed in such a way that they stimulate the desire to discover and

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[3]Wright, Lin. 1985. Personal conversation, Theatre Department, Arizona State University, Tempe.

then to understand. The goal of this provocative approach is to instill a sense of appreciation and generate protective feelings within the public.

The way in which attributes of a setting are arranged to meet needs, and integrated with the script, provides structure in which the public can intellectually and cognitively "buy" the past (Leone 1981). It is within this structure that the user brings life to the setting through his imagination, aided by the interpretive products and his own textbook knowledge. What he takes away are the performers' messages, effectively communicated because of the "extraordinary reality" of the setting in which they have been conveyed (Leone 1973).

A Satisfactory Experience

Rather than the simple communication of facts, the interpretive process is defined (Tilden 1967) as an educational activity undertaken to reveal meanings and relationships through the use of original objects, firsthand experience, and illustrative media. Through this activity, framed within the context of user experiences and values, an attempt is made to create understanding and excitement, and to stimulate curiosity (Alderson and Low 1976; Grater 1976; Grinder and McCoy 1985; Tilden 1967). In terms of cultural resources, the interpretive process should primarily function to distinguish between information and the image created when the public is made aware.

Interpretive images are evoked through the material remains of past human activity, which have typically been treated as passive objects of functional use. A more provocative and creative approach would be to present these remains as elements of daily living analogous to our own. Material remains become relevant to contemporary usage through interest, relationship to personal needs and experiences, and perceived psychological and physical betterment (Fritz 1978).

Information is conveyed in cultural resources interpretive settings by means of a script. "Script" encompasses all aspects of textual and verbal material associated with a particular setting, including maps, signs, labels, exhibits, storyboards, brochures/guidebooks, and oral presentations. In guidelines for creating scripts, development of a conceptual and methodological framework has been emphasized (Frese 1960; Leone 1981; Tilden 1967). Conceptual issues to be addressed are who the visitors are, why they come, and their sense of involvement, belonging, and identity with heritage (Alderson and Low 1976).

Methodological issues focus on the approach used to convey the desired information content, including compare/contrast, imagination, or thematic emphases (Grinder and McCoy 1985). Perceptual and analytical skills are sharpened as the result of similar objects being presented in a way that clarifies their differences when compare/contrast approaches are employed. It is equally important to present objects that are clearly contrastive, which aids in the understanding of similarities. Compare/contrast approaches demonstrate archeological techniques and develop skills within the participating public. In the thematic emphasis approach, an interpretive product is designed around a single or common theme with a clearly-defined learning goal. This approach, other than its use in the broadest sense to develop a key message for a setting, contradicts the provocative format proposed herein.

Children respond positively when stimulation of the imagination is used as an approach since they are generally not bound by adult conventions (Grinder and McCoy 1985). While this approach may be more difficult in adult application, the role of interpretation has been cited as the provocation of a sense of curiosity and excitement. One method for achieving this, in terms of script, is to create a story which focuses on people within the context of the setting. By putting people in the setting, a relationship with the public is established which allows for the use of the imagination regarding elements of human nature and daily living.[3]

Once a framework is established, interpretive information should be presented as a discussion between the questioning public and the inhabitants of the area (Frese 1960). Indeed, it has been argued (Leone 1981) that the past cannot be represented in lifelike fashion if the presentation is one-sided. This discussion between past and present must be based on what the target segment needs. Brief, inspiring, and luring terms should be used since the public will generally be standing. An element of movement or action which conveys that those who have lived in a setting could return at any moment should be incorporated in the composition (Alderson and Low 1976; Tilden 1967). It is proposed that interpretive products designed following these guidelines will be in contrast to those most typically experienced: memorized dogma repeated in a setting which has been stripped clean of any evidence of life, present or past, leaving the visitor with a feeling he may look but not touch.[4]

To ensure that interpretive objectives are met, a set of guiding principles aimed at enhancing user experiences in recreational/leisure settings is offered (cf. Field and Wagar 1984:13). These are that (1) users and leisure settings are diverse and a variety of approaches will be required; (2) a relaxed and enjoyable atmosphere is anticipated; (3) interpretive information must be rewarding; (4) interpretive information must be readily understood; and (5) feedback is essential. In addition, principles particular to cultural resources interpretation have been identified (Hoffman

[4]Pilles, P. J., Jr. and D. Freeman. 1981. An interpretive concept for Nuvakwewtaqa Ruins in Chavez Pass. Ms. on file, Coconino National Forest, Flagstaff.

1984). These are that presentations must be positive and appeal to curiosity or self-interest, and language must be clear, concise, contemporary, and non-offensive. Our interpretive goal is to create a link between the user and the information being presented. Our purpose is to assure that the user understands what is being done, what the objectives and the implications of the activity are, and what is expected from him (Warner 1978). Through the use of creative methodological and theoretical applications which identify and address public issues and concerns this can be achieved.

MARKETING CULTURAL RESOURCES

Recent National Park Service and other surveys have documented increased and higher use of cultural resources sites than scenic or other recreation areas. While it is recognized that historically people have shown an interest, these observed increases emphasize that there is a market for cultural resources interpretation. In response to this demand, the Forest Service has initiated a recreation strategy aimed at meeting user needs. One part of the stated objective of this strategy is "to achieve a spirit of innovation through empowerment of USDA Forest Service people to take actions that move recreation into its full role."[5] The delivery of quality cultural resources interpretive products is one such action.

In order to accomplish this action, user needs must first be defined. Information required to define these needs includes data on user demands, perceptions, and values, barriers to use, and predictors of use trends and user behavior. This is part of the marketing process, a conceptual framework within which mechanisms for telling our national heritage should be developed. This framework's foundation, listening to the customer and finding out his needs and wants, is no different from that upon which effective cultural resources interpretation is built. Tools with which to assess needs and wants remain to be designed.

After these initial assessments are made, target markets can be selected. Two critical factors in this selection process are the use-potential of a given population segment (e.g., income and education levels, use patterns of free time, availability of recreation time) and geographic proximity. When targets have been selected, products can be developed. For national forest recreationists, the product is the user's experience; in this case it is the cultural resources interpretive experience.

Critical elements in product development and the assurance of a satisfactory user experience include purpose, price, place, and promotion. The purpose of cultural resources interpretation (e.g., information, orientation, entertainment, primary or secondary attraction,) and price/value relationship (e.g., worth the time, trip, effort) are directly related to the segment which has been targeted. The place at which the experience occurs is determined on the basis of its location and accessibility, and on the ambience/atmosphere of the setting. Data need to collected on what attributes constitute a high quality "place," and furthermore, how "quality" is defined for diverse sites, user groups, and activities. Ways to promote the experience and make the public aware must be developed, based on assessments of media, messages, symbols, and communication styles that are most effective in reaching out to diverse users, encouraging a conservation ethic, and controlling vandalism.

To summarize, several issues critical in the design of effective cultural resources interpretive products that require further inquiry and synthesis have been identified. In particular, a synthesis of National Park Service, tourism, museum, and outdoor recreation studies is needed. This would serve as a foundation upon which inquiry regarding local community benefits, appropriate places and levels of interpretation, effective exhibitry and promotional techniques, price/value relationships, and the types of interpretation that are accepted and understood could be conducted. Further, syntheses would aid in the development of feedback mechanisms designed to evaluate and assess cultural resources interpretive policies, actions, and products as they are implemented.

Within the context of the Forest Service's recreation strategy, we have been challenged to provide cultural resources interpretive products. The marketability of the product depends on generating interest; this can be achieved by offering a unique experience which tells an important story that captures attention. Our goal is positively to influence public opinion. This will be accomplished through leadership in exploring new technologies and alternatives for meeting the wide-ranging needs of forest users, and in creative applications which enhance public appreciation and understanding.

[5]USDA Forest Service. 1988. Chief's implementation schedule for National Recreation Strategy, dated 2/5/88.

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Bringing the Past to the People: a Research Proposal for Cultural Resources Interpretation and Education on the National Forests[1]

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INTRODUCTION

Within the U. S. Forest Service, a strategy has been designed to help the National Forests achieve their full potential in meeting the recreation needs of all Americans. Cultural resources interpretation has been identified as one means of meeting recreational needs. Region 3, the Southwestern Region of the Forest Service, contains a vast array of cultural resources, but little thought has been given to providing interpretive opportunities. There are no regional visitor centers dedicated to cultural resources, the potential of cultural resources to generate revenue has not been considered, and opportunities for visitor centers, special emphasis areas, and recreational facilities related to interpretation and cultural resources have not been analyzed and identified. Because Region 3's potential has not been tapped, an interagency work group was formed to identify research topics relevant to cultural resource interpretation and public education, and to create a research plan which can serve as the foundation for the full development of the interpretive potential.

The process for cultural resource interpretation occurs within the guidelines provided in Forest Service Manual Title 2300,

Recreation, Wilderness, and Related Resources Management, and Chapter 2390, Interpretive Services. Seven objectives are stated for interpretive services (see Appendix A). Their focus is on gaining an appreciation and understanding of the Forest Service's role in resource conservation and management while providing recreation opportunities and facilities. Interpretive services is a management tool for use in meeting these objectives; by extension, cultural resource interpretation is also a management tool.

In light of the foregoing, the Cultural Resource Interpretation and Public Education work group defined goals for interpretive activities (taken from the Region 3 Cultural Resources Interpretive Action Plan), and assessed the status of knowledge and technology in interpretation. Based upon these goals and assessments, two broad topical research areas were identified. One is the need to compile and synthesize the existing literature specifically concerned with cultural resources public education and interpretation, and the research necessary to identify Forest user profiles, wants, and needs. The other research area involves an evaluation of each type of cultural resources public interpretive and education program currently operating in, or associated with, the Forests. A discussion of implementation strategies and cost estimates are included with each research project.

GOALS

The goals of the Region 3 Cultural Resources Interpretive Action Plan address concerns important to the the public, the Forest Service

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manager and the professional archeologist. The Forest Service will provide the visitor with a unique, meaningful, quality experience. This experience should and will include the complementary aspects of recreation and education.

The Forest Service views visitors as a diverse assortment of users who place different demands on the Forests' resources. Each user has varying degrees of interest, knowledge, and levels of expectation regarding interpretation of cultural resources.

The research proposed to support the interpretive plan will incorporate input from researchers, but also from on-the-ground personnel at all levels. It is not intended to tax the existing workload of these project managers. It will, however, have the long-term result of providing field-going personnel and line officers with supplemental information which will facilitate future project activities.

The archeologist will have at his or her disposal a body of information to enter into previously untapped sources for partnerships, eventually leading to increased awareness of our cultural heritage, and hopefully to a reduction in vandalism and a rise in a protection ethic.

Regardless of the inherent user-group differences, the Forest Service is committed in its efforts to expose each visitor to a variety of cultural resources in a variety of formats. Our goals for a productive interpretive plan are four-fold, and center on the themes of service to the public, and awareness and appreciation of cultural resources. Our goals are simply to:

- serve people by providing opportunities for diverse audiences to discover and enjoy cultural resources on Forest Service lands;

- contribute to an appreciation of our cultural heritage and its relevance to present day life and people;

- enhance recreational experiences for Forest visitors through quality interpretive programs and materials; and

- strengthen cultural resources protection through increased public awareness and understanding.

STATUS

There is no comprehensive data base or report on the "state of the art" with regard to cultural resources interpretation. Many agencies, universities, and organizations are providing public interpretation of cultural resources. However, it is difficult to obtain information on who is providing interpretation, their methods, their audience, and the effectiveness of their programs.

Currently, the National Park Service is developing a data base, called the Listing of Education in Archeological Project (LEAP) Clearinghouse, on Federal archeology public awareness activities but it does not include State, local, or private efforts.[8] This data base includes information on methods used to interpret cultural resources to the public and can, therefore, provide a framework upon which we can build.

To our knowledge, no studies have been conducted on the kinds of users interested in cultural resources. The few studies conducted on the effectiveness of cultural resources interpretive programs are site specific and not well known (Leone 1981).[9]

To develop an effective cultural resources interpretive program, much information is needed. First, we must find out who our users are and what they want. We need to establish a user characteristics profile: average age, educational level, occupation, and interests. Secondly, what is the user's perception of cultural resources and of a quality recreational experience? For example, do people perceive cultural resources as part of their heritage, an educational experience, or something useless? Thirdly, what are the Forest Service's needs and perceptions? What are our management requirements? Do we need to allocate cultural resources to different use categories? Do we need to inventory all cultural resources before we design a public interpretation and recreation program? Is there a perceived need both inside and outside the Forest Service for a cultural resources public interpretation plan? And fourthly, what is the effectiveness of various public interpretation strategies? By determining the effectiveness of signs, brochures, displays, tours, participation on excavations, and the like, one can design the best public interpretation program to meet user needs and wants.

In summary, little is currently known about cultural resources interpretation. Before the Forest Service develops an interpretation program, we must develop a comprehensive research plan to obtain information on:

1. user characteristics and needs;
2. public perception of cultural resources;
3. Forest Service management needs and perceptions; and
4. the effectiveness of various public interpretation strategies.

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[8] USDI National Park Service. 1988. Listing of Education in Archaeological Project (LEAP) Clearinghouse. Archeological Assistance Division, Washington, D.C.

[9] See also Kelley, Linda B. (Hohman). 1986. A Heritage to Tell: Public Outreach in Archaeology. MA Thesis, Department of Anthropology, Arizona State University.

RESEARCH PLAN

In the following we propose a research plan to address the problems identified above (see Appendix B for related considerations).

Research Project Priority 1: User-Needs Research

This first research project is composed of two steps. The first step is to compile, synthesize, and evaluate the available literature on user needs. These data will form a basis to develop a marketing study that will provide information, for the researcher and Forest Service management, not available in the existing literature

Step 1: Compilation, synthesis and evaluation of available literature.

Rationale.--Our concensus is that there is a body of literature that pertains to the public education and interpretation of cultural resources. However, this literature is subsumed within a wide variety of other categories, making its retrieval difficult and thus compromising its usefulness.

We recommend a research project in which the appropriate categories of literature are searched for all references to the interpretation of cultural resources undertaken for the express purpose of educating the general public. These references would then be obtained in some readable form by the researcher, assessed for content, annotated, characterized, and accessioned into a special cultural resources public education and interpretation library. Both the annotated bibliography and the reference library will provide a valuable component to the Forest Service's cultural resources management effort and will represent a unique resource for non-Forest Service researchers, interpreters, educators, and managers.

Implementation.--The mechanisms for identifying, locating, and retrieving the appropriate references are not considered here. We assume this project will be undertaken by a trained and competent researcher who will be provided with adequate and sufficient tools and resources to accomplish these tasks. Our work group discussions highlighted a series of literature and data categories containing references to cultural resources public education and interpretation. We list them below with examples of the types of appropriate reports. We emphasize that this does not represent a complete listing of potential bibliographic sources.

- outdoor recreation
- archeological site public interpretation (e.g., Kwas 1986)
- cultural resources protection (e.g., Ontario Ministry of Culture and Recreation 1976)
- public involvement with archeology[10]
- public perception of cultural resources (e.g., Texas Historical Commission 1984)
- visitor surveys
- tourism surveys and literature (e.g., Farrell with Angevin 1986).

We suggest that this research be conducted by one GS-9 Forest Service employee or equivalent. The research project will extend over a six-month period, during which time the appropriate references will be identified, obtained, analyzed, annotated, classified, and archived. We realize that all the extant literature will not be identified or obtained, hence the establishment of a time limit is appropriate. We also realize that this valuable resource must be made available for other research projects recommended by our group, and to Forest Service interpreters and managers at the earliest possible opportunity. We also strongly urge that this literature compilation and annotation project be continued as a small but ongoing activity by an appropriate Forest Service employee. We also recommend that the final disposition of this resource be the USFS Rocky Mountain Station Library, so as to be accessible for searches via the FS INFO system.

Estimated Cost: $20,000 for a six-month study.

Step 2: Marketing Studies on Forest Cultural Resources Users

Rationale.--It is anticipated that the information gathered during Step 1 will not be sufficient to develop a user profile. Therefore, Step 2 is a marketing study to obtain necessary information not available in the extant literature. Market studies help producers tailor their goods to meet the expectations of consumers. For land managers, market studies are useful tools for deciding how to reach Forest visitors with messages that can inculcate an individual sense of responsibility for leaving unharmed our nonrenewable cultural resources. These studies enable Forest Service managers to produce effective messages that lead to cost-effective allocation of Forest Service dollars and to a more certain degree of "customer satisfaction."

Implementation.--While we realize that this is not the proper forum to recommend specific operational aspects of a marketing study, we do think that multiple studies should be conducted to identify and gather sufficient information with which to base management decisions for public education and interpretation of cultural resources in the National Forests. Data should be collected on the following broad categories:

- visitor profiles, including demographic and socioeconomic data;

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[10] For example, see the periodic newsletter issued by the Institute for American Research, Tucson, AZ, titled Archaeology in Tucson.

- visitor expectation and satisfaction data; and
- visitor attitudes towards cultural resources in general, and public interpretation in particular.

Considering the fact that the Southwestern Region is environmentally variable and that studies dealing with the interaction of users and the environment have not been investigated, we recommend that the research be conducted region-wide and stratified by natural zones. Analysis of these data may provide information on what kinds of places provide the most satisfactory experiences for the widest array of visitors. Additionally, this research may enable managers to define "quality" for activities and areas, facilitate quality on-the-ground management of cultural resources, and lead to a stronger conservation ethic and reduced vandalism.

Research at the Lyndon B. Johnson National and State Historical Parks (Mills and Wegner 1985) provides useful examples of data gathered in a recreational park setting.

Estimated Cost: $50,000 for an eighteen-month study.

Research Project Priority 2: Determining the Effectiveness of Existing Public Programs

Rationale

There is considerable diversity in Forest Service cultural resources public education and interpretation programs, including on-site interpretation, outreach programs, and public participation programs. Determining the effectiveness of established public programs is an obvious mandate for research efforts.

Substantial amounts of time and money are spent each year in Region 3 on Arizona Archaeology Week activities, the Site Stewards Program, and public archaeology at sites like Elden Pueblo. Public involvement at the sites of Shoofly and Besh-ba-gowa, and volunteer programs like SWAT (Southwest Archaeological Research Team), are sponsored by State and municipal agencies, volunteer and service-oriented organizations, and individuals. These programs serve as ready-made research laboratories that provide a broad spectrum of information on education and interpretation. Other efforts are represented by brochures, videos, and displays. The success of existing efforts needs to be examined, including personnel and funding concerns, prior to expansion of existing programs or new program developments.

A program designed to research the effectiveness of existing efforts should measure changes in public attitudes toward cultural resources, the degree to which people choose to participate in historic preservation or archeological activities, trends in pothunting and other forms of cultural resource vandalism, public awareness of the values inherent in historic and archeological resources, and public satisfaction with the education and interpretation opportunities provided. The following examples are offered:

Implementation:

Example 1.--In particular, the effectiveness of the Site Steward program as a public outreach effort to detect and deter vandalism should be evaluated by selecting a sample of sites that are regularly monitored by Stewards and comparing them to a control group of sites with similar physical and locational characteristics. Monitoring both groups of sites semi-annually over a period of several years would provide objective, quantifiable data on program success in accomplishing what it was designed to do.

Estimated cost: $2,000 per year for a period of five years = $10,000 total.

Example 2.--Arizona Archaeology Week activities are designed to increase awareness of cultural resource values and influence public attitudes about historic preservation and archeology. The effectiveness of this comprehensive public awareness campaign should measure levels of public participation during the week-long activities, assess trends in vandalism observed by State and Federal agency archeologists and law enforcement officials, and solicit, through questionnaires, public attitudes on the importance of preserving cultural properties. Research should compare the various types of media, messages, and communication styles used in relation to how effective they are in encouraging a conservation ethic. A starting point for research on this program is already available in annual reports prepared by the Arizona State Historic Preservation Office. These reports summarize basic information on all activities sponsored statewide.[11]

Estimated cost: $8,000 per year for a period of five years = $40,000 total.

Example 3.--The effectiveness of participatory archeology programs, such as those at Elden Pueblo, Shoofly Ruin, and Besh-Ba-Gowah, should be evaluated by charting participation levels over a period of years and by asking participants to complete questionnaires designed to characterize their awareness of archeological values, their attitudes toward cultural resource preservation, and their perceptions of whether those programs met their expectations as educational experiences.

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[11] Hoffman, Teresa L. and Shereen Lerner. 1988. Arizona Archaeology Week: Promoting the Past to the Public. Paper presented at the 53rd Annual Meeting of the Society for American Archaeology, Phoenix.

Estimated cost: $2,000 per year for a period of five years = $10,000 total.

Example 4.--Smaller interpretive/educational efforts, such as brochures and self-guided interpretive trails at sites, should be evaluated by on-site interviews with a sample of visitors employing a brief list of standardized questions. Questions should address the visitors' perceptions about the quality of the interpretive products provided at the site and should assess whether the visitors' expectations were met. Examples of each type of prehistoric and historic site in the Forest cultural resources inventory should be studied. To accomplish this, cooperation will be necessary, and perhaps shared research programs developed with the National Park Service, State Park systems or other organizations.

Estimated cost of this research: $4,000 per year for a period of five years = $20,000 total.

CONCLUDING REMARKS

This proposed research complements and supports the National Recreation Strategy.[12] It will provide the quality information necessary to accomplish the proposed strategy in the most efficient and cost-effective manner and it will allow us to respond to the changing needs of Forest users, develop high quality public interpretation and education programs, and accomplish the job through partnerships.

APPENDIX A

CHAPTER 2390 of the Forest Service Manual deals with interpretive services planning and management. Interpretive services are designed to develop in the National Forest visitor an interest, enjoyment, and understanding of the natural environment. The objectives of interpretive services are:

1. To assist those visitors to the National Forest, research projects, and State and Private Forestry locations in gaining a greater appreciation of the role of conservation in the development of the Nation's heritage and culture.

2. To promote visitor understanding of the Forest Service, the National Forest System, Forestry Research, and State and Private Forestry programs.

3. To inform visitors of recreation opportunities and facilities on the National Forest.

4. To help visitors know and experience the natural environments.

5. To implement an interpretive program that helps solve management problems and aids in the development of public understanding of Forest Service management.

6. To expand the number of interpretive associations which contribute to public understanding of Forest Service practices, support interpretive services objectives, increase public awareness, and aid in management of National Forest resources.

7. To increase visitor understanding of natural and cultural history principles and their relation to land management techniques.

APPENDIX B

RELATED CONSIDERATIONS

During the course of our discussions and report preparation, the Public Education/Interpretation work group generated a series of recommendations which we present here for consideration. They are not projects necessitating formal and planned research; rather, they represent activities and products which we feel will greatly benefit the efforts to improve and manage public education and interpretation of cultural resources in the National Forests in particular and on public lands in general.

Evaluation of Future Interpretive Programs

An integral part of an interpretive program is a system to monitor and evaluate project activities. As demonstrated, although many successful outreach and public programs have been established, few contain a mechanism to measure, describe, and quantify the effectiveness or lack thereof of the programs, and to disseminate the information to participants and organizers of similar programs. Furthermore, few opportunities exist to share these results. In addition, some programs involve sites and issues important to another user: the Native Americans. When possible, Native American input should be sought and incorporated into project evaluation, as it provides a perspective necessary to the interpretive process. Likewise, feedback from visitors is crucial; their input may result in changes ranging from a simple modification in sign wording to adjustment in physical on-site behavior to prevent vandalism.

In effect, an evaluation aspect builds into the program a formal mechanism for determining whether or not the stated objectives were met; and if not, why not. Management decisions to continue, expand, eliminate, or repeat programs are all facilitated by the existence of evaluative data.

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[12] USDA Forest Service. 1988. The National Forests: America's Great Outdoors. National Recreation Strategy: Research Implementation Plan. Washington, D.C.

USDA Forest Service. 1988. Serving People by Opening the Doors to the Past: Cultural Resources Interpretive Action Plan. Southwestern Region, Albuquerque, NM.

Information Exchange

Numerous public-involvement programs have been implemented within Region 3 and across the nation. Yet, little is known regarding the content, duration, or success of these programs. It is recommended that some mechanism for information exchange be established. Proposed channels of communication are national and local forums, professional and amateur newsletters, and publications. For example, public outreach workshops or symposia should be part of the Society for American Archeology and Society for Historical Archeology annual meetings, and activity updates should be presented at local professional meetings. Several program-specific and professional newsletters are produced in which program activities could be reported. Finally, conceptual, methodological, and technological aspects of public involvement programs, especially successes or failures, should be published in the variety of journals available.

Popular Summaries

We see several advantages in producing popular summaries of technical reports generated by cultural resources projects. One advantage is the increased availability to the general public of current, understandable information about the past. Popular summaries written as byproducts of scientific projects will have the timely involvement of the project participants, thus increasing the accuracy of the publication. Public-oriented literature emanating from scientific projects supported by public funds provides a tangible return for the expenditure of tax dollars. The publication and marketing of these popular summaries through local or regional associations strengthens these partnerships and cooperative agreements.

We recognize the necessity of allocating additional resources toward the production of popular summaries. A commitment will be necessary from the contracting agency or office to provide additional time and funds in the project budget specifically for the production of a popular summary. Obviously not all cultural resources investigation projects can or should generate an additional summary for the public. Large-scale archeological or historical surveys and projects that deal with multiple periods of prehistory and history, for example, are reasonable choices for development of popular summaries. Similarly, the percentage of resources allocated to popular summary production will be correspondingly small in projects with large budgets.

Interagency Cooperation Through the Region 3 MOU

An arrangement to facilitate cooperation and technology transfer among agencies has recently been established with the signing of a Memorandum of Understanding among Region 3 of the Forest Service, the Arizona State Office of the Bureau of Land Management, Arizona State Parks, Arizona State Historic Preservation Office, Arizona State Land Office, and the Hopi Tribe. Although the semi-annual meetings called for in this MOU are primarily a vehicle to evaluate the Site Stewards Program, this MOU should be also be used as a forum for ensuring that information on public education and interpretive efforts is shared and that opportunities for interagency cooperation are explored.

Cooperating Educational Associations

Partnerships with local and regional interpretive associations (for example, the Northern Arizona Natural History Association and the Southwest Cultural and Natural Heritage Association) and non-profit educational societies should be encouraged to provide an additional avenue for cultural resources public education and interpretation. Forest personnel should be allowed reasonable amounts of time to work with these associations.

Publication and sale of interpretive literature through authorized cooperating associations should be supported by top management as an efficient means to publish and distribute interpretive literature free of the encumbrances and cost of doing so through GPO. Net profits can be donated by the associations to the Forest Service and used to support research, produce more special publications, and assist interpretive services.

The paramount value of of such partnerships lies in providing interpretive media that help Forest users enjoy the Forest in a safe and minimally abusive way, and understand the value of their Forest resources.

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Research Toward the Year A.D. 2000: Archaeology and the National Forests[1]

Steadman Upham[2]

Abstract. -- Key research themes are identified and discussed in relation to the cultural resources management obligations of Federal land managing agencies. Comprehensive programs of research are needed to resolve important issues in archaeology related to the development and collapse of social systems, site formation, and site transformation processes. Additional research is needed on the issues of adaptive diversity, archaeological visibility, site dating, and synthetic interpretive scenarios.

INTRODUCTION

My first professional contact with the U.S. Forest Service was in 1976, when I worked with A.E. Dittert, Jr. and other archaeologists from Arizona State University to complete an archaeological survey and mitigation of sites on several hundred acres of land northeast of Payson, Arizona. The land was slated for exchange to the private sector, but in 1976 the notion that private developers would use that land appeared remote. After all, the area was well out of town, and was only accessible by a rutted two-track that dissolved without ceremony in the slightest rain. Just less than a year ago, however, I had the opportunity to drive northeast along Highway 260 on my way out of Payson. There along the ridgelines where we had found, recorded, and tested a dozen pithouses and tri-wall structures, were the silhouettes of summer homes and condominiums. Apart from being startled by the pace of development in this Arizona community, these domiciliary testaments to contemporary land-use strategies brought home to me a disappointing professional message: the archaeological fieldwork we had done on these base-for-exchange lands, and the ensuing laboratory analyses permitted only the barest interpretation of prehistory.

Instead of data synthesis or a breakthrough in methodology, fieldwork and analysis provided but another assemblage of Verde and Tonto Brown (I still don't know which one has mica in the temper, or was it in the clay?), some non-descript lithics reflecting, as I recall, an "expedient" technology, and the standard ream of field notes, plan and profile maps, and laboratory work sheets. We had worked hard in the field for the requisite 10-week field season, and we had done the work under the close supervision of the temporary Forest Archaeologist. We had written and submitted a lengthy report, and it had been approved as a clearance document. But we didn't learn anything new about local and regional prehistory, or about archaeological methodology on this project. We didn't learn anything new, because we hadn't asked the right questions.

I find no basis for recriminations in this lost opportunity. Yet the kind of scenario I just described has been repeated again and again over the last two decades in the Southwest. I maintain that shoddy work is not to blame in such situations. Rather, I believe the opposite is true in most cases: fieldwork has adhered to the highest professional standards, and laboratory analyses have made use of state-of-the-art methods and techniques

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[1]Paper presented at the Cultural Resources Research Symposium, National Park Service Albright Training Center, Grand Canyon, Arizona, May 1 - 6, 1988.

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when possible. Why, then, don't we find theoretical and methodological breakthroughs by the yard in Southwestern archaeology; why don't we learn something new about prehistory and archaeology on each project we undertake?

I believe the answer to these questions resides in two separate but interrelated issues: First, the independence of archaeologists working both in and out of the federal bureaucracy has selected for a contemporary contract archaeology without regard for regional research designs. Such an absence is felt most critically in federal land-managing agencies who must administer diverse holdings, and whose typical CRM project is limited to small clearance surveys. Second, key prehistoric research themes, both methodological and theoretical, have not been widely accepted as generally relevant by the professional archaeological community.

In Region 3, these two issues have been addressed twice in week-long symposia over the past seven years, once under a framework similar to NARTS (National Archaeological Research Topics [Green and Plog 1983]), and once in the context of predictive modelling (Cordell and Green 1984). I was fortunate to be a participant in both symposia, and in this paper I incorporate many of the lessons learned during those thought-provoking sessions. In the remainder of this paper, I identify what I consider to be the central research issues for prehistoric archaeology on the National Forests of the Southwestern and Rocky Mountain regions. The way such issues articulate with integrated regional research designs is beyond the scope of the present paper, but has not been overlooked.

FOUNDATIONS OF AN APPROACH TO RESEARCH ON THE SOUTHWESTERN FORESTS

The American Southwest is one of the most ideal natural anthropological laboratories in the New World. In this geographic region, innumerable archaeological sites bridge prehistory and history and testify to long-term occupational continuity. Detailed, if incomplete historical and ethnographic records, augmented by deeply rooted oral traditions, back the continued existence of native peoples on their traditional lands. The Eastern and Western Pueblo, Ute, Pai, Pima, Papago, and Athapaskans are living testament to persistence on the land, and the details of their landscapes speak to the complex history and prehistory of these aboriginal peoples in the Southwest. For archaeologists, unparalleled conditions of preservation have been combined with sparse vegetative cover, a rich and highly variable archaeological record, trees that can be read like calendars, and an unbroken chain of human occupation that covers more than 10,000 years.

Moreover, details of the major events that punctuate the last 10,000 years of world history -- the emergence of agriculture, the beginnings of sedentism, the rise of village life, the formation of complex social systems, the proliferation of cultural and ethnic diversity, the formation of supra-village economic systems, the beginnings of pan-regional commerce, social and economic collapse, abandonment, European colonization, and the colonial legacy of enclavement and compartmentalization -- are written silently in the prehistory of the Southwestern region and between the lines of its incomplete historical and ethnographic records. Consequently, the limitations on defining *key prehistoric research* themes are only imposed by matters of individual preference, by long scientific and historical traditions that serve to demarcate important research domains, and by the connectivity of anthropological issues that invariably results from the interconnectedness of culture process. These elements unite to form a dominant research paradigm at any point in time, and the issues I identify below as "key" should be viewed in this perspective.

One of the most important functions of a research design is to identify research domains that distinguish relevant from irrelevant data. In this paper, I do not offer a research design, being charged instead with identifying key prehistoric research topics. In some respects, such an exercise is akin to reading a map without knowing precisely what the destination is. Nevertheless, I do believe that several key areas can be identified that structure most, if not all archaeological inquiry in the Southwest. I am instructed in my partitioning of Southwestern archaeological research by a few previous attempts to come to grips with this encompassing issue (Cordell, Schiffer, and Upham 1983; Cordell and Upham 1984; King and Plog 1984). I also draw on an important recent synthesis of Southwestern prehistory (Cordell 1984).

THE DEVELOPMENT AND COLLAPSE OF SOCIAL SYSTEMS

In previous Forest Service symposia, the topic of social development and collapse was discussed under a broader rubric, "The Rise and Fall of Civilizations" (Green and Plog 1983; Cordell and Green 1984). Although I participated in these symposia, I am no longer so theoretically expansive, preferring now to view the process of social development and collapse outside of pejorative labels like "civilization." Yet, like previous efforts I concur in part with the assessment for needed research on this general topic, believing that most, if not all of the substantive issues related to sequences of cultural development are subsumed by this theme. I believe the following major and minor research domains, while of intrinsic value unto themselves, must be addressed systematically if archaeologists are to be able to explain the development and collapse of Southwestern social systems.

Agriculture

The practice of agriculture in the prehistoric Southwest has continued to stimulate the curiosity of contemporary investigators, just as it did when the first corn cobs were unearthed in dry caves and rockshelters of the Four Corners area at the turn of the century. The aridity and generally marginal environmental conditions for agriculture in the Southwest have led many investigators to believe that a continued reliance on cultigens was an unlikely alternative for prehistoric groups. Over the years, many Southwestern archaeologists have assumed that risky environmental conditions made an agricultural lifestyle unpredictable and subject to periodic failure.

Now, Minnis (1985) has brought new information to bear on this topic and has indeed suggested that food stress and subsistence failure were common in some areas of the Southwest during prehistory. More critically, Minnis suggests that Southwestern groups knew about corn and other domesticates long before they began to rely on them; that the decision to practice agriculture was as much an organizational decision involving important social and economic criteria, than one related to perceptions of an improved subsistence base. Data clearly show that ignorance of cultigens or cropping practices did not keep past Southwesterners away from agriculture.

Like many important studies in archaeology, Minnis's work reminds us that questions related to the adoption and practice of agriculture can be framed in relation to time-space systematics (when and where questions), process (what and why questions), and cultural identity (who questions). In the late 1980s, it is appropriate that all three types of questions are relevant to archaeological research, depending on the nature and extent of investigation. At the present time, however, some categories of information on prehistoric agriculture and its relationship to the development and collapse of social systems are of more immediate importance than others. These categories are listed briefly below:

(a) Dating the Appearance and Adoption of Cultigens

Key questions remain regarding the earliest appearance of cultigens in the Southwest (Simmons 1985). Other questions relating to the differential adoption of agriculture also remain unanswered (Upham *et al.* 1987). A final set of questions pertains to the importance of cultigens in the subsistence regime of Southwestern groups, and the extent to which prehistoric Southwesterners relied on cultivated foods (Cordell 1984). Naturally, each of these questions has both a local and regional answer.

Partly as a result of Minnis' work, archaeologists have started to reexamine data related to agricultural beginnings in the Southwest and to identify when the first cultigens arrived in the region from Mexico. Indeed, one of the major topics of the 1980s in Southwestern archaeology has been the antiquity of the first maize (although squash was most certainly the first Southwestern domesticate). During this decade, positions have changed as more and more data have been made available. As the 1980s began and the re-excavation of Bat Cave was in progress, Southwestern archaeologists were moving toward revising the date for the earliest maize; 500 B.C. was a date frequently mentioned (Berry 1982). This very recent date contrasted markedly with Herbert Dick's published dates of 3500 B.C. (1965) for the Bat Cave material. A more recent date for the appearance of maize was also bolstered by radiocarbon dates between 1000 B.C. and 500 B.C. on Bat Cave corn (see Cordell 1984).

Yet some archaeologists have continued to maintain that maize has

considerably greater antiquity in the Southwest. This position has received a boost from two recent discoveries. Simmons (1986) dated organic material associated with maize pollen from sites in the San Juan Basin to approximately 2000 B.C., suggesting that corn agriculture, albeit at low levels, was being practiced in the Southwest by that time. In a second development, Upham *et al.* (1987) dated eight-rowed corn (Maiz de Ocho) recovered from rockshelter sites in the Organ Mountains of southern New Mexico to 1225 B.C. This latter find is especially significant in tracing the ancestry and antiquity of maize in the Southwest, because Maiz de Ocho is not the earliest variety of maize found in the region. That credit belongs to a maize variety known as Chapalote. Maiz de Ocho, however, appears to be indigenous to the Southwest, having developed in the arid deserts of southern New Mexico and northern Chihuahua as a hybrid from Chapalote and a more primitive eight-rowed variety (Upham *et al.* 1987). An estimated age for Chapalote given these new dates now appears to be about 2500 B.C. More research, however, is needed to date the appearance of maize in the Southwest in many different regions. Given the present information, differential rates of appearance, adoption, and reliance on cultigens would be expected.

(b) Identifying Southwestern Cultigens

It is assumed in traditional models of Southwestern agriculture that maize, beans, and squash formed the basis of agriculturalists' diet. More and more evidence, however, points to the use of a wide variety of cultigens, including the cultivation of native plants (Fish *et al.* 1985), and the manipulation (burning, pruning, etc.) of native species to enhance productivity. Before aboriginal agricultural subsistence systems can be described accurately, the full range of "crops" must be identified.

It is equally important to begin to evaluate the likely productivity and environmental tolerance of different strains of prehistoric cultigens. Archaeologists often hold such variables constant in reconstructions of past subsistence patterns. Yet, it is clear that significant productive differences between varieties of cultigens might have conferred differential competitive advantages to groups relying on them. Similarly, cultigens with high tolerance limits for variable climatic conditions might also have conferred significant advantages to particular groups. Experimental work, like that of Denmeade and Shaw (1960) or Classen and Shaw (1970), is needed to provide data on these important issues.

(c) Identifying and Explaining the Development of Agricultural Implements and Facilities

Twenty years ago, Ester Boserup (1968) pointed out that innovations in agricultural implements and facilities often result in increased agricultural output and demographic capacity. In the Southwest, the productive relationship between different kinds of agricultural implements (e.g. dibble stick versus hoe) is essentially unknown. Moreover, systematic data pertaining to the evolution of key agricultural facilities like storage units, water and soil control features, and field houses are lacking; developmental sequences for agricultural facilities are often anecdotal and localistic, and are rarely incorporated into regional culture histories. Broader level syntheses are needed to relate agricultural facilities to the agricultural system in use at any particular time. Recent work on Pajarito Plateau field house systems by Preucel (1987) exemplifies the kind of data needed to move forward in this area.

Demography

Issues related to the size, density, and distribution of population in the Southwest are at the core of virtually every significant problem in the developmental history of different regions, and are especially relevant to problems involving the development and collapse of social systems. Yet archaeologists have been unable to reconstruct, except with the crudest of measures, the demographic history of any single region with sufficient precision to offer *unequivocal* evidence that demographic factors were directly or indirectly related to other developmental processes. It is commonly assumed, for example, that the increasing size and density of a population is directly related to overall increases in the complexity of the sociopolitical organization, and to a variety of productive processes leading to craft specialization, subsistence intensification, and social stratification. I and many other archaeologists have advanced arguments based on this, or a variation of this theme. It is the case, however, that our measures of demographic variables

have often been rigid and have not reflected more than differences in the simple physical size of a settlement or series of settlements relative to those of preceding or subsequent periods. Key research needs to be undertaken on the way archaeologists estimate the demographic parameters of past populations, and specific attention needs to be paid to the biases of different estimators (e.g. floor area, number of rooms, site size, number of vessels per room, etc.).

Related to the actual measures used to reconstruct the size of past populations are processes that are believed to be causally linked to increases or decreases in demographic capacity. It is generally assumed, for example, that regional population growth is related to the shift from gathering and hunting to agriculture; that population growth led to territorial and/or resource circumscription, and "forced" populations to alter their subsistence strategies (cf. Cohen 1975). Support for this causal link is found ethnographically, and in episodes of economic development in the Third World (Boserup 1965), but archaeological data from the key epochs of world history provide conflicting evidence of the relationship between demographic and productive variables. The archaeological record of the Southwest provides a unique laboratory where key data can be obtained to study the transformation from food collecting to food production.

A series of issues have been raised recently that deal with the demographic characteristics, epidemiology, and sociopolitical organization of Southwestern populations, especially the Pueblos (see Upham 1986). These questions focus on *(a)* the size of native Southwestern populations, especially during the late prehistoric periods and early contact periods, *(b)* the role of epidemic disease and European-introduced acute crowd infections in population reduction immediately following contact, and *(c)* the degree and extent of complex sociopolitical organizations in the Southwest during the different prehistoric periods. Obviously, a full consideration of these issues is beyond the scope of the present paper. Suffice it to say, however, that the previous generation of archaeologists were heavily influenced by ethnographic descriptions of native Southwestern groups.

Today it is recognized that although the seminal ethnographies contain a wealth of valuable data, they depict the social, political, and economic arrangements *and demographic structure* of groups after a long and disruptive contact history. Population reduction due to disease and other factors, population dislocation and resettlement, the dissolution of native belief systems and their replacement by the Christian religion, and the imposition of new political and economic systems have all contributed to dramatic changes in native societies. Archaeologists have finally begun to examine the archaeological record in light of these changes and have sought to place the ethnographic descriptions of Southwestern groups in proper perspective. Continued research on these demographic and related issues is required to resolve the apparent conflict between the historic and prehistoric records.

Settlement

An obvious corollary to arguments involving demographic and subsistence change is found in the issues of residential mobility of past populations, and in the emergence of sedentism as a primary settlement strategy. The general patterns of world history suggest that a prerequisite for the development of emergent social and political hierarchies is a sedentary or semi-sedentary lifestyle, in which substantial portions of each year are spent in permanent settlements. Social and political systems characterized by emergent political hierarchies thus probably existed in very small numbers before the origins of agriculture and other strategies of food production. Based on archaeological and ethnographic data, their occurrence would be predicted in resource-rich environments, like those seen in temperate zones along the Pacific coast of North America at the close of the Pleistocene. Following the origins and spread of agriculture, the number of emergent social and political hierarchies increased rapidly.

Traditionally, sedentarization is linked to groups involved in food production, groups residing in those regions where sufficient natural resources permit the establishment of permanent settlements, or, more recently, groups in the throes of modernization or development. As such, sedentarization is normally associated with *(a)* certain kinds of environments (those either conducive to agriculture or naturally resource-rich), *(b)* surplus

production (at least production sufficient to carry a group through the four seasons of the year), or *(c)* the availability of resources or capital from more developed groups, a slightly different kind of "natural resource" (Kenyon 1959:35; MacNeish 1964:531; Braidwood and Braidwood 1953:278). I term this process *sedentarization through abundance*. Many discussions of sedentarization through abundance, especially in the archaeological literature, are thus directed to the study of purely environmental considerations (availability of water, amount and quality of arable land, abundance of natural resources, climate, etc.). If one were to survey the anthropological literature on sedentarization, especially in the Southwest, this pathway to sedentary life would appear virtually exclusive.

A focus on purely environmental issues and on sedentarization through abundance, however, obscures a very important issue. It is the case that another alternative, *sedentarization through impoverishment*, is just as common, if not more common, than the traditionally accepted explanation. Sedentarization through impoverishment has been occasionally described in the anthropological literature (see Barth 1961). Sedentarization through impoverishment can occur in a variety of ways but most often begins when population increases and a given landscape becomes "packed." Among pastoralists, a packed landscape decreases the amount of available pasturage, stimulates herd reduction strategies, and can result in the eventual loss of animals. If unchecked, entire herds can be lost and households can be forced to join existing settlements, almost always in dependency relationships with other households or supra-households and in circumstances of greatly reduced status. Among gatherer-hunters, a packed landscape decreases foraging range, increases competition for increasingly scarce resources, and may stimulate intensified procurement strategies. In the Southwest, like many other regions of the world, many such gathering and hunting populations may have responded to increased population densities by joining agricultural communities. Such communities existed as "magnets" on the landscape in much the same way that trading posts or mission stations do today in remote regions (Lee 1972a, 1972b). Exactly which communities were selected by gatherer-hunters may relate to long term social relationships between foragers and farmers and to the kinds of "alliances" described by Bender (1978:210-213). Gatherer-hunters, like pastoralists joining sedentary communities, also existed in positions of greatly reduced status.

Arguments seeking too strong a link between environmental variables and the process of sedentarization often mistake the environmental setting as causal. As I intended to show above, sedentarization through impoverishment is fundamentally a demographic process (Cohen 1977:83). As Hitchcock (1982:231) points out,

> Simple availability of resources (is) insufficient to bring about residential stability for an extended period of time.....Long term residential stability comes about when a group's mobility options are restricted due to the fact that there are too many other groups occupying the habitat.

Key prehistory research needs to be initiated to investigate the pathways to sedentarization in the Southwest. Given the variety of options available to prehistoric populations, there is no simple correlation between population size and density, mode of subsistence, and patterns of residential mobility. Rather, the weight of evidence strongly suggests that the causes and consequences of sedentarization are multiple.

Labor

In the Southwest, partly as a result of past interpretive traditions in American anthropology, it is not customary to suggest that human labor and labor processes were key variables in the developmental history of native groups. The lingering Apollonian perspective of the Pueblo coupled with other obfuscating interpretive elements (e.g., the land claims cases, see Upham [1987] for a discussion of this point), have combined to make discussions about the organization and management of labor *disputatio non grata* in the Southwest (for example, Reid [1985]). This view is unfortunate, since labor and labor processes are fundamental in all societies (Saitta and Keene 1988), even in the absence of social classes. In the Southwest, considerations of labor and labor processes are of importance to many different issues, but are of

critical importance to specific arguments about *(a)* agricultural intensification, *(b)* storage, *(c)* site construction, *(d)* productive specialization, *(e)* and exchange.

Several archaeologists have sought to show how variation in the organization and management of labor with respect to each of these issues affects the form, structure, and development of past social and political systems (Judge and Schelberg 1984; Lightfoot 1984; Upham 1982). Others have focused on broader processes, like the beginnings of agriculture or the pithouse-to-pueblo transition, that are evident in the archaeological record of the Southwest (e.g. Gillman 1987; Minnis 1985; Whalen 1984). More work needs to be undertaken on the organization of aboriginal labor and the way it was managed at the household, village, and regional level both for the specific research issues noted in the previous paragraph, and the more general pan-Southwestern processes identified above.

An example of how such research is accomplished, is illustrated by Betancourt, Dean, and Hull (1986), who add a new dimension to our understanding of resource extraction and labor management in the Chacoan regional system. Construction of the Chacoan road network, a feat requiring the mobilization of sizeable labor pools, has been directly tied to resource extraction activities necessary for construction and development of the canyon core (Betancourt, Dean, and Hull 1986). One such activity was the long-distance transportation of construction timbers, involving the movement of at least 200,000 logs more than 75 km. This kind of resource extraction posed a major logistical obstacle to the Chacoan Anasazi. Such an obstacle looms especially large in the organizational development of the system when it is considered that the average log measured of 22 cm in diameter, 5 m in length, and weighed 275 kg (ibid.,:370). Additional logistical activities associated with logging also necessitated the organization of substantial labor pools. Dean and Warren (1983:220-230), for example, detail how task groups "felled, trimmed, debarked, sorted into size classes, and cut to predetermined beam lengths" the hundreds of thousands of timbers required for construction.

When one begins to attach people to this enterprise, the meaning of this undertaking assumes far greater importance. Although the exact number of people required to complete this project remains unclear, it is certain that the number was in the hundreds, if not thousands. These people would have had to have been provisioned during their trips to procure timbers and such systematic labor would have had to have been supervised, even if only at a rudimentary level. Similarly, it is unclear if major logging expeditions were mounted from the canyon proper, or if logistical groups from outlying communities nearer to the timber sources actually supplied the requisite labor. In some respects, the exact form of logistical organization is irrelevant since both logistical strategies suggest very centralized control over the organization and management of labor. The latter strategy, however, suggests a higher degree of systemic integration throughout the Chacoan regional system.

What is clear from the recent work of the Chacoan researchers is that the 402.3 km of major and secondary Chacoan roads that have been identified, and especially the 9 m wide Great North Road, West Road, and Southeast Road, were built to surmount the obstacles posed by such monumental undertakings. Moreover, the labor requirements of this specific task, that may have required the involvement of many different population centers, provides important new information about the overall integration of the Chacoan system. Inferences about increased integration are bolstered by additional documentation of an elaborate system of signaling stations that linked Chacoan outliers together and to the major population centers in the canyon core (see Cordell 1984:256). In the case of the Chacoan regional system, Betancourt, Dean, and Hull's research augments previous analyses, and is indirectly tied to the nature of formal links in the system (especially, roads and signaling stations) that integrated populations who occupied the San Juan Basin during the eleventh through thirteenth centuries. More research in this *genre* is needed on many issues, but especially on those related to site construction, agricultural strategies, and craft production.

Economy

It is axiomatic to suggest that all of the above topics are interrelated, but nowhere are such interrelationships as evident as in discussions of variation in the economies of prehistoric groups. My treatment of economic issues must necessarily be

circumscribed by the limitations of space, as well as by the present ability of archaeologists to describe and explain elements of prehistoric economic systems. Consequently, rather than discuss "economies" *per se*, I will focus my remarks on one of the outward manifestation of viable economic systems: local, regional, and pan-regional exchange.

The role of exchange in the development and collapse of past social systems has been one of the dominant topics in anthropology during the last decade. Although opinions vary over how important exchange might have been as a motivating factor in the evolution of hierarchical social and political systems (compare, for example, Blanton *et al.* [1981] with Sanders [1972]), few dispute the fact that exchange is involved in this change process.

In a previous paper (Upham 1986:212-213), I have discussed variability in exchange systems, paying particular attention to exchange systems that operate at different scales and involve different spheres of exchange. I identify a local exchange system as one that operates within the confines of a single, spatially restricted settlement system. Elsewhere, I have termed such settlement systems *settlement clusters* (Upham 1982). Present data suggest that the overwhelming majority of commodities during all periods of Southwestern prehistory were locally exchanged. Regional and pan-regional exchange systems, on the other hand, are those that involve the exchange of goods between discrete settlement clusters in one region, and between groups of settlement clusters in different regions, respectively. Regional exchange appears to have involved more labor intensive or scarce goods like polychrome pottery and varieties of exotic materials, such as turquoise and certain minerals and pigments. With the exception of marine shell, which could have been traded in a down-the-line fashion, pan-regional exchange is barely visible archaeologically during most periods of Southwestern prehistory.

At the present time, archaeologists have a poor idea about the range of commodities that might have been regularly exchanged at the local and regional levels. Foodstuffs, for example, are assumed to have made up a substantial portion of the exchange base among many Southwestern groups (cf. Cordell 1984). Moreover, the exchange of food figures prominently in many Southwestern interpretive scenarios (e.g. Plog 1974; Lightfoot 1979) that posit redistribution or other economic levelling or buffering mechanisms. Yet in only a few cases can the exchange of food be unequivocally documented. Research needs to be undertaken that focuses on this important issue. Perhaps the most promising line of research pertaining to this issue involves isotopic analyses of various cultigens that "fingerprints" trace elements unique to particular geographic locations. Recovered plant macrofossils as well as food residues found on pots, potsherds, and food processing implements are amenable to such analytical techniques.

The ability to fingerprint trace elements and identify various geographic locations is also the analytical underpinning of other sourcing techniques that are now used routinely on Southwestern ceramic and lithic materials. The increasing use of source analyses in Southwestern exchange studies marks an important change in Southwestern archaeology. In many cases, the suspicion of widespread exchange of a particular commodity can now be unequivocally verified. Such verification has raised a variety of new questions about the structure of prehistoric exchange systems that could not be asked even five years ago. The recent work of Bishop *et al.* (1988) on the Jeddito Yellow Wares, for example, clearly identifies site-specific chemical signatures, and exemplifies the kind precision that can be expected in future source analyses. More importantly, however, the acquisition of site-specific chemical signatures also permits detailed reconstructions of the exchange network that emanated from any particular manufacturing center. Such work is limited only by the archaeologist's ability to acquire, analyze, and (pay for!) interpret relevant sherd samples. Work that follows the model of Bishop *et al.* should be undertaken on other ceramic wares and on the plethora of distinctive lithic materials found on Southwestern sites.

A separate but related area of inquiry that follows from the source analysis of artifacts is stylistic analysis that is focused on identifying the spatial distribution of distinct stylistic elements and motifs (Wobst 1974, S. Plog 1980; Wiessner 1983; Sackett 1985). Such research should be viewed as the natural extension of physico-chemical source analyses in exchange studies, and should be used to

identify prehistoric *information networks*. Such information networks may not always be isomorphic with networks in which material circulated. Rather, cross-cutting and/or overlapping ties are expected to have occurred along with those that parallel the direct transmission of commodities between groups.

Environment

It is not possible to write a paper about key research in the American Southwest and omit from consideration the general topic of environmental variability. I am, however, sorely tempted to do just that, to omit from consideration a discussion of research related to environmental variability and paleoenvironmental reconstructions. My reasons for such temptation are twofold. First, the contributions of one recent research project involving Gumerman, Dean, Euler, Hevly, and Karlstrom have been substantial, not only breaking important new ground, but also providing substantive results and direction for future research (Dean *et al.* 1985; Euler *et al.* 1979; Gumerman *et al.* in press). This comprehensive research should serve as a model so that future work in other areas of the Southwest can provide complimentary data on dendroclimatology, hydrology, palynology, and geomorphology in conjunction with archaeological data. Expanding from Gumerman *et al.*'s Black Mesa data set will enable archaeologists to correlate results across regions, providing many new insights into the affects of the paleoenvironment on culture processes.

Second, although there is no question that the exigencies of the natural environment affected the course of development of all prehistoric Southwestern groups in one fashion or another, it is becoming increasingly clear that cultural variables (demography, economy, etc.) were important, and in some cases more important, in structuring the character of a group's adaptation to particular environments. An abundant literature has now developed in Southwestern archaeology devoted to describing and explaining the way past environments altered, channelled, and facilitated the course of prehistoric cultural development in relation to social factors (see Cordell [1984] for a summary of this work). This work too has broken new ground and points the way for future research related to the development and collapse of social systems.

Given the substance of the work noted above, I defer at this juncture to offer anything more than my positive endorsement of these two categories of research. Active support for research programs to continue these efforts is encouraged, and the ensuing research should have a substantial payoff in years to come.

An active program of archaeological research undertaken with the six topical areas discussed above in mind will result in major advances in our general understanding of how social systems evolve, and will add to our more specific knowledge of local and regional developmental sequences in Southwestern prehistory. Such research, however, can only move forward in tandem with thoughtful methodological inquiry into the nature of the archaeological record, with specific examination of site formation processes, post-depositional transformation processes, and biases in data produced by observers and different field and analytical strategies.

SITE FORMATION, TRANSFORMATION PROCESSES, AND OBSERVER BIAS

Six years ago, Dee F. Green, then Regional Archaeologist for the U.S.D.A. Forest Service, Southwestern Region, and I wrote a research proposal to the National Science Foundation to study site formation processes, post-depositional transformation processes, and variation in survey data produced by observer biases (Upham and Green 1982). We planned to use the National Forests in the Southwestern Region as natural laboratory for a program of experimental archaeology that would assess the affects of various management and recreational processes on archaeological sites. After receiving an "excellent" rating on the proposal by anonymous reviewers, the NSF panel judged this research as both "too applied" and "risky", since it would bring the funding of research dollars normally intended for academic archaeology squarely to the portal of a CRM-oriented project. Additional concern was voiced over the fact that Green and I had planned to use a variety of real and manufactured archaeological sites for experimental purposes. Because I still believe that the research we outlined in 1982 is relevant today, I quote large sections of our proposal below in the hopes that it will stimulate other archaeologists involved in archaeology on the National Forests to take up the cudgel that Green and I reluctantly set aside.

Motivation for developing our NSF proposal derived from Green's and my concern over the increased pace of contract archaeology, in which more and more people with minimal academic training were being used as quasi-professional crew members on large-scale survey projects. Prior to 1974, archaeological work in the American Southwest had traditionally focused on excavation. During the last 15 years, however, the number of archaeological site surveys undertaken has dramatically increased. There are several reasons for this increase, not the least of which is the demand created by private developers, state and local governments, and Federal agencies for archaeological clearance work in compliance with cultural resource laws and regulations. The increase in site survey work has created much discussion within the discipline regarding the techniques and methods appropriate for management projects. One important aspect of these discussions has been the recognition that many current archaeological field methods are based on unexamined assumptions about the nature and character of the archaeological record.

There is a growing recognition that the archaeological record is not a static phenomenon, but one that is subject to a variety of external processes that affect the way archaeological materials (artifacts and features) are spatially distributed. Perhaps the most complete theoretical treatment of the potential transformation processes that can affect the archaeological record has been presented by Schiffer (1976, 1977, 1983, 1985). Schiffer describes a variety of different natural and cultural transformation processes that can alter the integrity of archaeological deposits. He also illustrates the dynamic character of the archaeological record by describing how archaeological materials can move between archaeological and systemic contexts. Most substantive attempts to define the extent and magnitude of various transformations have focused on natural processes affecting the archaeological record. Wood and Johnson (1978), for example, have identified a variety of natural forces (faunalturbation, floralturbation, cryoturbation, graviturbation, argilliturbation, aeroturbation, aquaturbation, crystalturbation, seismiturbation) that have the potential to displace, mix, and alter the integrity of archaeological deposits. This and other studies (Benedict and Olson 1978; Krause and Thorne 1971; Limbrey 1975; Rick 1976) follow from Ascher's original observation that a site's deposits exist in a dynamic matrix and are subject to variable degrees of contextual and associational change (1968).

Another genera of studies that have dealt with the formation and transformation of the archaeological record focus on the structural relationships between archaeological data, archaeological context, and the natural environment (Sullivan 1976, 1978; Jorgensen 1975; Wilcox 1975, 1977). Although these studies are, in large part, derived from the original work of Schiffer, they differ in one important respect: they attempt to define the logical relations between context (surfaces, deposits, features), objects (artifacts and materials used in past behavioral systems), and environment (including contexts transformed by natural processes). While such work shows promise, quantifying the effects of the environment has proven problematic.

Most archaeological research dealing with transformation processes has been directed toward understanding and measuring the natural forces responsible for altering archaeological deposits. Schiffer, however, correctly points out that both natural and *cultural* forces affect the surface and subsurface character of sites. While most archaeologists accept the fact that such transformations do occur, few archaeologists have attempted to measure the rate of change or the magnitude of change induced by cultural transformation processes (Burgh 1960; Bryant, Gehr and Flenniken 1981; DeBloois, Green and Wylie 1974; Lightfoot and Francis 1978; Wood 1979).

Another kind of cultural transformation process that is often neglected has to do with the introduction of observer bias during the collection of archaeological data. The increase in the number of site surveys has been accompanied by a growing awareness that archaeologists can introduce biases by the way they locate, identify, and record surface manifestations. Plog, Plog, and Wait (1978) have illustrated how variation in site densities and artifact inventories in particular regions can be largely the result of differences in observations and in the ways surveys were undertaken by different crews of archaeologists. A similar result was obtained by Bergman (1980) who found that different survey techniques and intensities resulted in substantially different findings,

depending on the amount of vegetative cover and the degree of alluviation. Both studies are beginning points; yet much remains to be learned about how different survey conditions (vegetative cover, weather, terrain) and differences in training and expectations of the survey crew affect the quality and reliability of survey results.

Key research needs to be undertaken on measuring the effects of several cultural transformation processes that occur routinely both in the course of management of Federal lands and in the performance of archaeological surveys for cultural resources management purposes. Such research could be ideally structured around the multiple-use activities of a National Forest. Consequently, a coordinated program of experimental archaeology, using both real and manufactured sites needs to be established to monitor the effects of various activities that occur as the Federal land-managing mandate is carried out.

Transformation processes and observer biases have important implications for interpretations that archaeologists generate from survey records. If site surfaces have been dramatically changed both by natural and cultural impacts, then site survey information on artifact context, association, and relational patterning are of little utility. Similarly, if different archaeologists do not consistently recognize, identify, and record the same types of information with the same potential error factors, then any apparent cultural variation between areas may simply be a product of the way the surveys were conducted.

Archaeologists have generally assumed that meaningful interpretations of past human behavior can be derived from inventories of surface remains. However, if we are to provide such interpretations from surface remains, the effects of transformation processes and measurement error by survey crews need to be measured. Assessing the effects of transformation processes and observer biases is particularly critical now, when millions of dollars of public money are being spent to inventory large portions of the Southwest.

It is clear that any attempt to assess the potential effects of natural and cultural impacts to site surfaces requires carefully controlled experiments that are designed to produce both short-term and long-term results. In addition, a natural laboratory is needed where impacts to archaeological sites result from relatively routine economic and recreational activities. Key research on this topic should allow for such experiments in a forest setting, and should be designed to quantify the way particular activities affect the character of archaeological sites. Given that archaeological survey is also a routine activity on the National Forests, experimental designs should be developed to measure variation in survey and recording techniques, and to identify cost-effective solutions to managing the disparate data bases that are created by this kind of observer bias.

Archaeologists and land managers alike need quantified and verifiable information on the effects of various human and natural phenomena on cultural resources. In many instances, archaeologists are in positions to influence decisions about the kind of activities that take place in particular areas, especially on federal and state land. These management decisions are often made without sufficient data to assess fully the impact of particular activities on archaeological sites. There are few experiments, for example, which quantify the actual horizontal and vertical displacement or loss of artifacts as the result of traffic (vehicular, human and animal) over a site (Bryant, Gehr and Flenniken 1981; DeBloois, Green and Wylie 1974; Wood 1979). The results of these studies are largely unsatisfactory owing to the absence of experimental controls. For example, the kinds and rates of artifact loss or displacement from sites near recreation areas are unknown; the actual effects of timber harvest operations, of controlled or uncontrolled fires, of grazing and other multiple resource uses are also unknown. Finally, the effect during site survey of differences in crew training, crew spacing and crew expectations has not been measured. Each of these has the potential to affect the reliability and, consequently, the interpretations derived from surface data.

Despite the lack of knowledge referred to above, archaeologists and land managers must continue to make judgments about the nature, value, and disposition of cultural resources. There is an urgent need to rectify the situation and provide the necessary data that will form a basis for making sound and cost-effective decisions about cultural resources.

INTERPRETIVE ISSUES AND TECHNICAL RESEARCH

One of the dangers in writing a paper that attempts to provide a comprehensive summary of research needs in a particular field is knowing when to stop. It is clear the dozens of other general topical issues could be raised in an essay of this sort that would be equally important as those already discussed. Because such coverage is clearly beyond the scope of the present enterprise, I chose to focus my remaining remarks on interpretive issues in Southwestern archaeology, and on problems related to technical research that must be completed if satisfactory resolution of these key interpretive issues is to occur.

In the following section, I identify two specific issues where technical research is needed to resolve disparities in interpretive positions. Both of these issues are tied to various parts of the previous discussions, and have implications for the way archaeologists view critical aspects of Southwestern prehistory. I conclude this essay with a summary of an interpretive position that has been advanced by several archaeologists that challenges key portions of existing culture history. Resolution of the issues raised here will require a comprehensive program of integrated research. Such research could be effectively coordinated under the auspices of the U.S.D.A. Forest Service, utilizing the diverse cultural resources found on the National Forests of the Southwestern and Rocky Mountain Regions.

The Definition of Culture and Adaptive Diversity

An earlier generation of archaeologists devoted its time to defining archaeological cultures and to refining local and regional phase sequences within a given culture area. Largely because of this pioneering work, archaeologists are now able to address other questions about culture change and stability. The identification and definition of archaeological cultures, however, are no longer viewed as scientifically justifiable pursuits in the field of Southwestern archaeology. Instead, contemporary archaeologists have sought to describe and explain aspects of the social, political, and economic systems for different Southwestern groups, and to characterize broad patterns in the adaptive history of regions. In the Mogollon and Anasazi areas, for example, several studies during the last five years have offered synthetic treatments of these issues at the regional level (Kintigh 1985; Lightfoot 1984; S. Plog 1986; Upham 1982). More importantly, however, Southwestern archaeologists have not proceeded to broader level syntheses in the absence of theoretical underpinnings. Models from economic geography, theoretical ecology, and evolutionary biology have all been adapted with varying levels of success. Some commentators have viewed these developments with alarm, citing the lack of unity in approaches and methods. Others, while acknowledging the "creative chaos" in approaches, view such work as largely positive (cf. Cordell 1984).

Although the eclectic nature of the field is well expressed in the diversity of approaches alluded to above, such eclecticism has not produced totally diverse and unrelated interpretations. A growing consensus is emerging, based on research conducted in many different regions, that Southwestern societies developed organizational strategies that were extremely *resilient* over long periods of time. These organizational strategies were not fixed and immutable once set into place, as some phase sequences would suggest. Instead, they were flexible and permitted wide latitude in a group's organizational responses to the exigencies of the natural and social environments. Braun and S. Plog (1982), Cordell (1984), Cordell and F. Plog (1979), F. Plog (1984), and Upham (1984; 1988) have all presented formulations that reflect this position. These researchers depict the archaeological record as a chronicle of organizational diversity that not only shows simple and complex organizational structures, but also portrays variability in these structures through time. Such a recognition has clear implications for non-linear developmental sequences and variability in rates of culture change.

Archaeological Visibility

The time-worn saying "Out of sight, out of mind" seeks to encapsulate the idea that perception is guided by what is prominent and conspicuous. Visibility leads to recognition; obtrusiveness garners attention. In archaeology, these dictums have meaning at the most basic scale of archaeological observation: describing and explaining variation in the archaeological record. It is true, for example, that the size and mobility of

any given population is proportional to the obtrusiveness of the remains it leaves behind. Archaeological remains produced by small, highly mobile gathering and hunting groups differ substantially from those of sedentary village or city dwellers. These latter adaptations often result in profound alterations to the landscape that are obtrusive and easily recognizable, even after hundreds or thousands of years. Gathering and hunting adaptations, on the other hand, result in much more ephemeral records of occupation that are easily blurred or obscured by later human activity, or simply by the passage of time.

If one accepts this reasoning, then the obtrusiveness of archaeological remains increased dramatically with the development sedentism and the emergence of food production. The emergence of food production and subsequent developments in technology, sociopolitical organization, economy, and ideology have been the focus of most archaeological work since the turn of the century. These developments have preoccupied archaeologists largely, I suggest, because the visibility and obtrusiveness of remains produced after A.D. 500 in the Southwest overwhelm those from earlier periods. It is also the case, however, that the adaptive history of the last 1500 years of some regions has been written as if the more obtrusive patterns were characteristic. Low visibility archaeological remains generally have not been a focus of study in regions where the remains of obtrusive patterns also exist.

It should be understood that equating low visibility remains with with gathering and hunting groups is over simplified and in some ways metaphorical. But my purpose is to illuminate structural differences between gathering and hunting and other adaptations that are based on food production. Archaeologically, there are vast differences in the kinds of remains produced by adaptations based on gathering and hunting and food production. Consequently, the metaphor can be used to illustrate how our interpretations of past human occupations in some regions have been influenced by the visibility of remains and by an over-attention to large sites or elaborate architecture. Contemporary Mayanists are still seeking to balance a prehistory that became overwhelmingly biased toward ceremonial centers during the first fifty years of this century (Marcus 1983). In the American Southwest, the "San Juan centric" view was dispelled during the 1940s (Reed 1942, 1948), but the prehistory of Chaco Canyon and Mesa Verde is still perceived by many to be "Southwestern archaeology." In this case, our perspectives have been shaped literally by what is most visible on the landscape. Our "field of vision" has been focused on, and in many cases restricted to architectural remains: villages, towns and cities.

The situation described above holds true especially in what are perceived to be extremely well known culture areas. In the American Southwest, for example, we know a great deal about Puebloan prehistory, especially *after* pithouse villages began to be built and the adaptive pattern was characterized by a measure of sedentism. The outlines of Southwestern prehistory are more poorly known for earlier periods. Conversely, during later periods in the Southwest, including the early historic period, groups who were mobile and did not live in permanent villages have virtually escaped archaeological interpretation. Only a few Manso, Yavapai, Apache or Seri sites have been recorded by Southwestern archaeologists, despite widespread and historically documented occupations. We have emphasized the more obtrusive patterns and constructed our periodization schemes based on the waxing and waning of their remains, in some cases to the virtual exclusion of any other patterns. Consequently, in many areas of the Southwest, especially those characterized by abandonment or collapse just before recorded history, the description of low visibility adaptations has been left to Spanish chroniclers or early travelers who have provided, in some cases, the only written record of the group's existence. This situation pertains even to those areas where low visibility adaptations were the characteristic pattern for *most* of the prehistoric period (cf. Upham 1984:243-245).

The issue of abandonments or collapse raises another important point related to low and high visibility remains. Because our periodization schemes are most often founded on the remains of the obtrusive archaeological patterns, shifts in adaptive strategies often go undetected by archaeologists. Adams alludes to this problem by expressing concern for identifying "transitional processes" that bridge "disjunctions" between periods of stasis (1984:82). It is the case that the record of human occupation in most areas of the Southwest is remarkably continuous, but the record of social, political, and economic development in

these same areas is often discontinuous. Continuity in social, political or economic development for more than a few hundred years is rare. Archaeologists use terms like abandonment and collapse to describe these latter "discontinuities", but in many cases what they are really referring to is the disappearance of the specific developmental pattern, not the disappearance of the people. Thus, one could argue that terms like abandonment, hiatus, or collapse are really archaeological shorthand for the episodic character of cultural development in the Southwest. Unfortunately, by using these terms our perceptions are focused on concepts that emphasize an absence of occupation rather than on ideas that seek to identify low visibility occupations and explain how transitions from high to low visibility adaptations occurred.

Redressing this problem often requires more than simply shifting one's interpretive emphasis. In the American Southwest, the time-space frameworks that exist in many cases actually preclude consideration of low visibility adaptations in the archaeological record. Constructing interpretations to account for this kind of adaptive variability often means confronting virtually every traditional assumption that has guided the work of Southwestern archaeologists since the turn of the century. Specifically, I maintain that the failure to distinguish between high and low visibility adaptations in the archaeological record has produced an *underclass* of Southwestern prehistory (cf. Upham 1988). By underclass, I refer to those groups in the Southwest whose adaptations, because of their unobtrusive character, have not been the subject of anthropological inquiry.

Key prehistoric research is needed on this important issue. Particular emphasis needs to be given to identifying and describing low visibility archaeological remains, and to explaining how such sites articulate with the broader patterns of settlement so often described in the culture histories of the Southwest. National Forests of the Southwestern and Rocky Mountain Regions provide an exceptional natural laboratory where appropriate field strategies can be developed and where experimentation can be initiated on analytical techniques that will facilitate modelling of low visibility phenomena.

Chronometric Dating

Very little work in archaeology can proceed in the absence of chronometric dating. The ability to date site occupations undergirds virtually every important aspect of archaeological interpretation. As Cordell, Schiffer, and I noted in the first Forest Service symposium on cultural resources,

> One of the most persistent obstacles to processual studies continues to be our inability to date precisely past cultural events, such as the manufacturing span of pottery types, the founding and abandonment of settlements, and the emergence at various scales of regional systems. Moreover, without sound chronological frameworks, it is nearly impossible to conduct refined studies on rates of change in behavior or organization, or to correlate changes in cultural phenomena with changes in environmental conditions (1983:25-26).

We went on to identify a dozen different research needs in the area of chronology. Although progress has been made on some of the 12 issues we raised, much work still remains. Rather than recapitulate these points, however, I refer the reader to our original article, and offer a more general discussion of needed chronological research, citing two examples where interpretation is presently impeded because of a lack of chronological precision.

In the Southwest, the development of dendrochronology has contributed to perceptions outside the region that unparalleled chronological precision is possible; that site dating is easy and certain. Such a perception has been enhanced by a number of other recent dating advances: *(a)* progress in dating small samples of organic materials by the radiocarbon method using technology derived from the linear accelerator and mass spectroscopy, *(b)* the development of new secular variation curves for archaeomagnetic dating, and *(c)* experimentation with methods of laboratory-induced obsidian hydration dating. These advances coupled with existing methods of relative dating (especially ceramic and lithic typologies) might suggest that the Southwest continues its role as

archaeology's chronological "Garden of Eden."

It is true that the Southwest has been a center for research on dating techniques (both relative and chronometric). The region also appears to provide more opportunities to use these techniques because of favorable conditions of preservation and the presence of suitable materials, like obsidian, for dating. Moreover, the past history of research on ceramic and lithic typologies in the Southwest has portrayed to outsiders an image of dating precision in the use of relative dating techniques. A number of analyses of material culture calibrated by dendrochronology or other advanced chronometric techniques, however, have presented data at variance with existing interpretations and typologies. Consequently, a re-examination of culture historical frameworks has begun.

Two areas of research are especially important. First, it has become clear that some projectile point styles are poor temporal indicators. This finding is important because Southwestern archaeologists routinely use projectile points to date sites and assign cultural affiliation. Obsidian hydration dating of San Pedro style points, commonly dated to the late Archaic period (1500 B.C. to A.D. 200 [cf. Haury 1950]), documents the persistence of this point style in some Southwestern regions well into the fourteenth century (Upham *et al.* 1986). Such persistence appears to be linked as well to the persistence of gathering and hunting adaptations and, consequently, re-examination has begun in many regions where such projectile point styles have been used to date "Archaic" age sites. Other analyses of so-called "archaic" style points also suggest that their temporal spans need to be reevaluated (Cordell 1984). Thus, chronometric dating has opened a new interpretive avenue by revealing the persistence of gathering and hunting during the late prehistoric period, and has called into question the temporal sensitivity of the traditional projectile point typology.

Second, it has been recognized that some Southwestern pottery types are not as temporally sensitive as once thought. Specific types of black-on-white pottery, for example, have been found to occur with much later polychrome, glaze, and/or black-on-red (orange) types. These inhomogeneous distributions have been documented for much of the plateau and montane regions of the Southwest (Upham, Lightfoot and Feinman 1981; Lightfoot and Feinman 1982; Lightfoot 1984; S. Plog 1986; Upham 1982). The co-occurrence of apparently "early" with late ceramic types has substantial implications for interpretations predicated on the contemporaneity of different kinds of sites in settlement systems. For example, in a recent synthesis of pithouse occupations in the Apache-Sitgreaves Forest (Hunter-Anderson 1986), an important conclusion is offered that suggests an increasing use of horticultural products through time, a process that is correlated with a reorganization of domestic activities in houses and an increase in storage space. Hunter-Anderson argues such changes are related to developing sedentism and to the need to store food for overwintering. This conclusion is dependent on an analysis that begins by partitioning sites into different time periods using a relative dating technique (dating by ceramic types). The ceramic typologies used by Hunter-Anderson are Colton's and related classification schemes that are not sensitive to the early-late co-occurrence phenomenon. These same changes in subsistence, residential architecture, and artifacts noted by Hunter-Anderson have been identified by other Southwestern archaeologists and have been interpreted in quite a different fashion. For example, citing inhomogeneous distributions of ceramics (as well as other data), Lightfoot and Feinman (1982) argue for greater contemporaneity among sites than does Hunter-Anderson, and for differences in status among and between site residents. I too have argued that intra-site and inter-site status differences occurred among some prehistoric populations during certain periods of prehistory, and have suggested that such patterns obfuscate what appear to be relatively straightforward chronological differences (Upham 1982, 1988).

Additional chronological research is needed to resolve these interpretive discrepancies. Such research needs to be systematic and extensive. A compendium of chronometric dates is needed to calibrate the date spans of particular diagnostic artifacts (decorated ceramics, projectile points, etc.) for each major region in the Southwest. A beginning point for such research is to incorporate into all scope of work statements the mandatory acquisition of chronometric dates for each project undertaken on the National Forests.

CONCLUSION

In the introduction to this paper I offered my lament over our inability to interpret the prehistory of the Payson area in relation to the broader themes of Southwestern prehistory. My lamentation is tied to the belief that overarching research themes, and comprehensive regional research designs *must* guide all archaeological inquiry. Such an approach requires interpretive scenarios that can be tested and evaluated with data acquired from each new project. Such an approach is also dynamic, leading to constant "tuning" and refinement of research themes, research designs, and (most importantly) interpretive scenarios. In this kind of enterprise, there is no room for professionally guarded "truths", or scientists who cling too tenaciously to pet theories. Instead, there are only slates of ideas that can be offered up, evaluated, accepted, rejected, or refined. I believe the above description of an "action plan" adequately describes the process of research. Within this infrastructure of research, those who undertake programs of attack, especially those who vilify other investigators, are not fit for the research enterprise and should be restricted in their participation.

Over the past decade, several interpretive scenarios have been developed that fit the research model I describe above. One of the most encompassing pertains to the late periods of prehistory and to the early contact period, when large Puebloan populations covered much of the central and northern Southwest. Aspects of that scenario are speculative, and require substantial additional research. Other elements of the scenario appear valid based on existing data, and lend tentative support to a revisionist notion of prehistory.

This interpretive scenario contains four primary points:

1. Catastrophic population loss during the first seventy-five years of Spanish contact, a process largely undocumented in the historical records of the northern Southwest, resulted from the introduction of acute European crowd infections (smallpox, measles, and influenza [Reff 1986 ; Upham 1980, 1982, 1986]). Moreover, initial epidemics appear to have spread within native interaction networks, and may have preceded actual face-to-face contact with the Spanish.

2. The loss of native population and the ensuing Spanish program of settlement reduction, missionization, re-education, and agricultural retraining inexorably changed the sociopolitical and economic fabric of native society (Upham 1980, 1982, 1983; Wilcox 1981). This colonial onslaught, although experienced differentially by various native groups, resulted in community enclavement and compartmentalization, a breakdown of inter-community ties, and perceptions by later historians and anthropologists that the distinctions between Southwestern native groups were more significant than similarities of economy, politics, and religion.

3. Late prehistoric and contact period populations in the central and northern Southwest were not uniformly sedentary, nor did they all reside in communities built in the characteristic pueblo style. They were, instead, an amalgam of both sedentary pueblo-dwellers *and* indigenous gatherer-hunters, a fact clearly reflected in contact period narratives written prior to A.D. 1600 (Upham 1982, 1984). This population structure has substantial implications for reconstructions that focus on regional interactive ties, and the amity-enmity relationships that characterized different sub-regions of the central and northern Southwest prior to and during the years of initial Spanish contact; and

4. Interdependent regional settlement systems were present during the late prehistoric period in the American Southwest and, although substantial organizational variability existed, hierarchical sociopolitical structures and managerial elite were extant in more than a few of these systems (Upham 1982; Lightfoot 1984; Upham and Lightfoot in press). Such organizational configurations facilitated high levels of inter-regional exchange (of various commodities), and exchange ties between communities and regions appear to have linked diverse populations in ways that transcended simple trading-partner relationships.

The point of offering this interpretive scenario is not to claim that it is right, but to provide a context for evaluating archaeological data from the late prehistoric and contact periods. Had such a scenario been extant in 1976, explicit hypotheses could have been derived from the

scenario, and some of the data from the Payson region might have been more parsimoniously described and explained. More importantly, however, the data from the Payson region might have aided in refining the interpretive scenario.

What is needed at this juncture in the development of Southwestern archaeology are more comprehensive scenarios for other regions and time periods. Wilcox and Sternberg (1983) have provided a comprehensive interpretive scenario for the Salt-Gila area of the Hohokam region; Judge and Schelberg (1984) have provided a beginning point for the development of such a scenario for the San Juan Basin. Doubtless other beginning points can be found. Active participation by the cultural resources management programs of the U.S.D.A. Forest Service in such a program of research will facilitate the development of this kind of approach, and over time will contribute to meaningful advances in our understanding of the human past in the Southwestern and Rocky Mountain Regions.

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Delivering the Past: Prehistoric Research Priorities for the Southwestern National Forests[1]

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INTRODUCTION

In this chapter, key prehistoric research themes are discussed in both applied research and management frameworks. The purpose of this chapter is to elaborate upon the research themes identified and discussed by Upham (this volume), and to provide specific research recommendations regarding the planning and implementation of a long-term program of archeological research on the National Forests of the Southwestern Region. To accomplish this task, the chapter is divided into five sections. In the first section, the relationship of research programs to the mission of the Forest Service is discussed. In addition, a discussion is provided that seeks to relate key prehistoric research themes to integrated research designs and to the broader issues of compliance with federal cultural resources laws and regulations.

In section two, a summary of key research topics is provided. This discussion is tied to an earlier effort to define archeological research themes for the National Forests (Cordell, Schiffer, and Upham 1983). Specific research problems and recommendations are presented and discussed in section three. These specific problems and recommendations are derived from Upham's chapter, and are intended to serve as examples of how key prehistoric research can be accomplished using archeological data from the Forests. We recognize that the program of research we envision must be flexible, and must be capable of being implemented in a variety of different areas with diverse resource bases. To illustrate both the promise and the potential difficulties of our approach, two discussions are provided in section four that describe the archeological resource bases of the Lincoln and Santa Fe National Forests in relation to the key prehistoric research themes identified by Upham. In the final section of this chapter, we provide a set of recommendations for implementing our research program that describes staffing and equipment needs, budgeting requirements, the role of contract research, and time frames for achieving the research objectives.

ARCHEOLOGICAL RESEARCH AND THE NATIONAL FORESTS

It is axiomatic that archeological research must proceed in tandem with the development of regional research designs. The development of research programs on the Forests must develop in accordance with this fundamental scientific principle, being in lockstep with the development of comprehensive, integrated research designs. To this end, the research discussed in this chapter and in that by Upham (this volume) must proceed in conjunction with prioritized research programs that follow from the preparation of integrated research designs. Such research must also be consonant with the goals of the comprehensive Forest Plan, and should articulate with the research design at the level of cultural concept, geographical limit, and chronological limit. Moreover, planned archeological research needs to

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be undertaken within the constraints of existing study units, operating plans, and management units. It is recognized, of course, that the character of the archeological data bases that are unique to each of the Forests in the Southwestern Region will determine the kinds of research that can be undertaken. The integrated research designs should speak to this issue, as the success of any research program is directly related to the adequacy of the data base that is employed.

Research on and management of cultural resources requires a recognition that the allocation of cultural resources is fundamental to both enterprises in a multiple-use context. Allocation, however, requires high-quality data upon which critical decisions regarding the disposition of cultural resources can be made. At present, the existing archeological data bases (site records, artifact inventories, site reports, etc.) of the Southwestern Forests are inadequate to undertake a comprehensive allocation program. Serious deficiencies exist in areal coverage, and key descriptive information on variability in site types is uneven or absent. The results of this lacunae are seen most profoundly in archeologists' inability to predict the location of specific kinds of sites given sufficient descriptive parameters and prior conditions (Cordell and Green 1984). Consequently, it is not yet possible to enter into an allocation strategy that would permit the identification of specific site categories and allocate them for highly selected uses (e.g., conservation, research, and public interpretation).

To remedy these deficiencies, a comprehensive program of inventory and evaluation must be undertaken with the specific intention of providing critical baseline information on the nature, extent, and diversity of archeological resources on the National Forests of Region 3. Evaluation of existing data in the Forest Service site files should begin immediately in an effort to determine where archeological survey needs to be undertaken and what survey intensities should be used. Moreover, all existing site information needs to be computerized in a standardized format so that central access to survey data is possible. Until both of these objectives are met (comprehensive inventory survey and computerization of site files), it would be unwise to pursue a strategy by which cultural resources were allocated to any specific category of use.

A beginning point in the development of an allocation plan is the preliminary work of Spoerl and Tainter (1983). Their research, and that of the other participants in the 1982 and 1983 cultural resources symposia (Green and Plog 1983; Cordell and Green 1984), should be consulted to identify management and research needs from the past. These documents are now in need of revision, but their use will ensure the development of institutional memory with respect to this planning effort, and will permit a more coherent developmental approach to cultural resources management on the Forests. It is important to point out that the underlying theme of Spoerl and Tainter's work is that allocation cannot proceed in the absence of comprehensive long-range planning coupled with sufficient funding to permit archeological resources to be allocated for research, conservation, public interpretation, and a variety of other uses.

The program of research outlined here and in Upham's chapter requires that the Forest Service accommodate the discipline of archeology and those fields that support it (dendrology, palynology, materials science, geomorphology, etc.) within the structure of the Research Stations presently in existence. Funding for this enterprise is also required to ensure continuity over the long term. It should be recognized that investing in this kind of research program will be of long-term benefit to the Forest Service in that it will provide critical assistance in the following areas:

a. Compliance with federal cultural resources laws and regulations, especially as they relate to the broader mandate of the National Environmental Policy Act, the National Historic Preservation Act, the Archeological and Historic Preservation Act, Executive Order 11593, the Archaeological Resource Protection Act, and all of the associated regulations that serve to guide the implementation of the above legislation;

b. Establishment of a comprehensive allocation strategy that is defensible in light of the non-renewable character of the archeological record, the multiple-use mandate of the Forest Service, and the research needs of the professional archeological community;

c. Preservation of a large portion of the archeological record for future generations of Americans, thereby contributing to development of an historical persona for Native and Anglo-Americans alike; and

d. Development of a program of public interpretation to allow for education through participatory archeology, displays, and site reconstructions.

In the following sections of this chapter, we summarize current research directions and identify specific research problems that can be addressed using archeological data from the Southwestern Forests.

SUMMARY OF RESEARCH TOPICS

Archeology as a discipline possesses neither a unified body of theory nor a unified notion of key research topics. The Southwest is a large region of great natural and cultural diversity. The research interests of archeologists working in the area reflect this diversity in the studies undertaken and the methods used. It is not possible to arrive at a consensus of important prehistoric research questions for the

Southwestern Forests. Not only do the archeologists working at any one point in time differ over relevant questions and applicable methodologies, but interpretive paradigms and recovery techniques change at a rapid pace. Any research questions identified today may not be considered relevant in a year. In a discussion of "Forest Research Topics" arising from the Cultural Resources Allocation Conference held in May 1982, it was stated that, "In each case where a permit is requested to excavate a site on a National Forest, or where data recovery is proposed in response to a management or compliance requirement, archeologists will be expected to develop research designs that relate in positive ways to one or more of the Topics" (Cordell, Schiffer, and Upham 1983: 10). We argue to the contrary: that the Allocation Conference report reflects the particular biases of the six conference participants, and should not be considered a laundry list of the only, the most relevant, or the most appropriate research problems for prehistoric sites in the National Forests. Innovative approaches and unusual research problems will be more appropriate for particular locales and should not be excluded from consideration by the Forest Service because they are not outlined here.

Furthermore, and in response to a question posed at the conference, it is not possible to outline a program for research at prehistoric sites on the National Forests that will produce a complete record of the prehistory of all populations ever inhabiting those areas. If we had the capability to do this it would have been done. The data recovery, documentation, and interpretive techniques needed to perform such a desirable end are not available to us now, and hence there is a need for continuing methodological studies, interaction among archeologists with differing points of view, and resource conservation.

An integrated research program on the National Forests is unquestionably needed, but a reasonable goal of such a research program cannot be the completion of all archeological work on the Forests nor a record of prehistory that is "as close as we need." The goal of such a program should be to integrate research on the Forests and ensure optimal allocation of resources in light of the current and future archeological potential of those sites to address relevant research concerns.

Recognizing this, we can provide a summary of many, but certainly not all, current research topics for prehistoric resources. Upham's paper (this volume) provides a detailed examination of research relating to the development and collapse of social systems (agriculture, demography, settlement, labor, economy, and environment), site dynamics (formation processes, transformation processes, and observer bias), and interpretation issues (adaptive diversity, visibility, and chronometric dating). These are all relevant and significant research questions, but will not be discussed here in detail. The reader should consult Upham's paper for details on these questions.

The earlier effort by Cordell, Schiffer, and Upham (1983) provided even greater detail on these and additional questions. An outline of their suggested research themes and the research and development efforts they recommended for approaching each topic is provided below. The reader should consult the original volume for greater detail and justification for each topic.

I. The Rise and Fall of Civilizations

a. Sedentism

1. Refine methods for determining the degree of sedentism in the archeological record.

2. Undertake simulation models of hunter-gatherer behavior.

3. Delineate resource distributions and Archaic scheduling activities.

4. Evaluate the demographic consequences of sedentism, the material correlates of sedentism, and the use-life of structures.

5. Assess the distribution, function, and size of various types of storage facilities.

6. Determine whether we can evaluate population size on the basis of storage facilities.

b. Large Settlements and Complex Systems

1. Test theoretical models for the evolution of sociopolitical complexity involving "causal" variables.

2. Assess the extent of productive specialization and the role of specialists in society; evaluate various means of examining specialization, and changes in technology and style accompanying complexity.

3. Develop site occupation histories and paleoenvironmental reconstructions.

4. Evaluate status differentiation within sites through studies including the examination of burial practices and diet/access to food.

5. Examine restriction of access to information (sacred/esoteric) in part through spatial distribution of styles.

6. Determine the role of small sites in sustaining populations at large sites.

7. Assess the relative importance of environment as opposed to social relationships in determining the location of large settlements.

c. Agriculture

1. Determine the relative productivity of various Southwestern cultigens.

2. Determine whether species believed to be wild were actually manipulated and/or cultivated by Southwestern populations.

3. Evaluate the determinants of agricultural intensity and the labor requirements of various cropping strategies.

4. Assess what can skeletal populations can tell us about the diet and health of Southwestern populations.

5. Determine what early prehistoric northern Mexican agricultural strategies can tell us about the introduction of agriculture in the Southwest.

6. Refine our models of climatic change, and our methods of chronological control over the dating of changes.

7. Delineate the material correlates of various types of agricultural practices.

d. Regional Organization

1. Reevaluate existing models of the spatial distributions of sites.

2. Develop spatial models for societies at different levels of complexity.

3. Reassess site-function interpretations.

4. Map the distribution of natural resources in the Southwest.

5. Map the distribution of rare or unique architecture in the Southwest.

6. Map the distribution of agricultural features and evaluate the labor investments made in each kind of feature.

7. Undertake ethnoarchaeological research on task group composition in societies at different levels of complexity.

e. Protohistoric/Ethnohistoric Periods

1. Search archives for information on Southwestern groups during historical time periods.

2. Assess the response of ethnographic groups to foreign intrusion.

3. Study refugee sites on the Santa Fe National Forest.

4. Examine archives and archeological data on the construction of churches/missions, and the sizes of harvests, fields, and storage facilities in historic sites.

5. Assess the role of exchange during the ethnohistoric period.

6. Evaluate how the development of an ethnic identity in the Southwest was influenced by the presence of a foreign power.

7. Estimate population during the protohistoric and historic time periods.

II. Environmental Change

a. Continue studies in sedimentology, hydrology, geomorphology, and palynology.

b. Develop new techniques for paleoclimatic reconstruction, especially using packrat middens and plant opal phytoliths.

c. Inventory and evaluate photographic archives, and documents relating to paleoclimate.

d. Assess past species diversity using archeological materials.

e. Reevaluate existing techniques of paleoclimatic reconstruction in terms of formation processes, particularly focusing on pollen analysis.

f. Assess rockshelter deposit formation and the effects of human presence in rockshelters.

III. Abandonment and Depopulation

a. Evaluate anthropological models for abandonment/collapse.

b. Develop methods to identify low-visibility social groups in the archeological record.

c. Develop methods to evaluate population changes through time.

d. Determine conditions under which migrations occur.

e. Evaluate collapse of regional systems and disappearance of boundary-maintaining devices.

f. Refine methods of determining homogeneity and heterogeneity within skeletal populations.

g. Study agricultural techniques at large settlements, and soil and fuelwood depletion.

h. Examine collapse as part of the normal developmental trajectories of complex systems.

IV. History of Land Use

a. Catalog documentary materials pertaining to vegetational changes.

b. Develop simulation and experimental models of land-use histories.

c. Compile data on evolutionary trajectories of modern biotic communities.

d. Determine prehistoric distributions of animal species.

e. Study land changes relating to agricultural practices/nutrient requirements of Southwestern crops.

f. Examine land-clearing for construction, fuelwood, and fields.

V. Chronology

a. Reevaluate dating techniques.

b. Develop techniques to date artifacts and ecofacts directly.

c. Develop techniques to identify formation processes for contexts from which datable materials are taken.

d. Date annual plants rather than wood wherever possible.

e. Determine average age of downed wood pieces in woodlands.

f. Refine archaeomagnetic dating curves for the Southwest.

g. Evaluate the effects of forest fires and fire management on dating materials.

h. Develop local obsidian hydration rates.

i. Reevaluate the number of well-dated sites in the Southwest.

j. Determine if thermoluminescence dating is useful for the Southwest.

k. Determine the use-life of various artifact categories.

l. Evaluate relative dating techniques.

VI. Unidentifiable Sites

a. Date unidentifiable sites.

b. Assess the distribution of unidentifiable sites across the landscape.

c. Map territories used by known groups.

d. Evaluate exchanges in material goods that may contribute to confusion in identifying the ethnic identity of site inhabitants.

e. Evaluate differences in lithic reduction technology of Puebloan and Archaic groups.

VII. Artifact Studies

a. Evaluate and refine techniques for determining sources of raw materials used by Southwestern populations.

b. Refine techniques for identifying manufacturing loci.

c. Evaluate ceramic vessel properties.

d. Plant experimental gardens using various techniques, and measure labor investment in planting and harvesting crops and harvesting wild plants.

VIII. Formation Processes

a. Investigate the effect of formation processes on inter-assemblage variability.

b. Improve site discovery techniques.

c. Evaluate various kinds of impacts on sites.

d. Experimentally study sherd breakage, and ecofact formation/preservation.

e. Evaluate formation processes of deposits (floors) used most often in interpreting past societies, and techniques for recovering information and artifacts from such contexts.

The research themes outlined in Upham (this volume) and Cordell, Schiffer, and Upham (1983) do not pretend to exhaust all research themes for prehistoric archeology. First, they deal almost exclusively with the formation and collapse of sedentary agricultural societies in the Southwest. Hunting and gathering groups are discussed primarily as they relate to the shift to sedentary/farming life, to interactions with contemporaneous sedentary/farming communities, and to resilient responses by farming communities to changing natural and social environments. Questions concerning PaleoIndian and pre-agricultural Archaic adaptations are not specifically addressed. Many of the general topical areas presented by Upham are relevant to such research, although not outlined as such.

Most of Southwestern prehistory was characterized by populations with hunting and gathering economies, and yet considerably less is known about these populations than about later farming groups. Research is needed to define the nature and extent of PaleoIndian and Archaic exploitation of Southwestern environments. Many PaleoIndian and Archaic sites are deeply buried and improvements are needed in techniques for locating and recording such sites. Archeologists are increasingly recognizing and excavating Archaic locales, and this research has led to controversy over the traditional view that Southwestern Archaic hunting and gathering populations can and should be differentiated into "cultures." These issues illustrate the need for reevaluating existing models of PaleoIndian and Archaic adaptations. Examples of research issues that should be addressed are:

a. Develop means to differentiate PaleoIndian and Archaic sites from lithic scatters associated with farming groups.

b. Delineate the distribution of prehistoric floral and faunal resources, and scheduling of foraging activities.

c. Evaluate the relative appearance of sedentism

and cultigens in various environments of the Southwest.

d. Determine how populations in different environments within the Southwest responded to the introduction of cultigens.

e. Assess the merits of defining Archaic cultures within the Southwest (e.g., Irwin-Williams 1967), as opposed to adopting a model of overarching uniformity in material culture (Huckell 1984) prior to the introduction of agriculture

f. Assess how stylistic boundaries were maintained in PaleoIndian point types, and what the widespread distribution of common styles indicates about intensity of interaction and social boundaries.

An important aspect of the development and collapse of social systems is the level of community organization and the presence of mechanisms promoting social integration. Two means of approaching the degree of intra-community organization include the examination of site structure and of ritual integration. The structure of sites at any point in time can tell us much about how the inhabitants of that site interacted with one another and organized the use of space for secular versus sacred or community versus elite activities. Changes in the use of space through time reflect changes in social structure and shifts in the integrative levels of various populations. The role of ritual as an integrative mechanism can be explored through the definition of specialized ritual architecture and assemblages within sites, the examination of burial offerings, and the distribution of particular decorative motifs in ritual contexts. Topics that should be addressed include:

a. Determine how populations organize the use of space for sites of different functions.

b. Evaluate where various activities take place within and outside of sites.

c. Map the size, frequency, and location of facilities used in integrative rituals.

d. Assess what the information in (c) tells us about the sizes of groups served by these rituals, and the types and levels of social integration present in the populations inhabiting the site or community.

e. Delineate the information content of ritual iconography, and rock art.

f. Determine how changes in the nature of ritual architecture/assemblages through time reflect changes in the sizes of populations served by these facilities and the portion of the society with access to esoteric knowledge.

Hundreds of additional research problems could be outlined, but this document provides what we feel is a good sample of research needs. In the following section, four of the research problems outlined above are reviewed in detail, and recommendations are developed for implementing such research.

RESEARCH PROBLEMS AND RECOMMENDATIONS

The Development and Collapse of Social Systems

Subsistence

Synchronic and diachronic aspects of prehistoric subsistence have been major topics in Southwestern archeology since its inception. Subsistence has received the greatest sustained attention among non-typological concerns due to the economic focus of much previous and current method and theory. The following problem areas require investigation of extra-cultural potential and constraint, as well as culturally-patterned strategy and response.

The Earliest Cultigens.--The addition of cultigens to existing subsistence orientations accelerated the rate of change in Southwestern societies and supported populations responsible for the bulk of the visible archeological remains. Timing of the introduction of crop plants, and particularly of the staple maize, has been fairly well bracketed in several Southwestern regions (Simmons 1986; Upham et al. 1987; Fish et al. in press). In spite of well-founded dates earlier than the 500 B.C. introduction suggested in an influential model (Berry 1982), questions persist as to the role of cultigens in the period following their appearance. Such questions include the roles of choice and compulsion in trends toward agricultural reliance, and the place of sedentism in this process.

Since identified remains of the earliest transition are few, effort must be concentrated on discovery. In regions yielding the earliest cultigens, there is minimal knowledge of subsistence patterns immediately preceding introduction. The chronological imprecision of projectile point styles is a difficulty to be overcome in locating appropriate sites. Stratified situations with good preservation such as caves have been critical in the past. However, Simmons' (1986) recovery of early maize evidence in open sites marked by low numbers of lithics is cautionary. Subsistence patterns spanning the transition must be acquired to model variation in initial adoption and degrees of reliance. Settlement frameworks are essential for placing early dates in a meaningful context.

The following sequence is suggested for initiating research: (1) inspection of existing site records; (2) revisitation of the most promising sites; (3) excavation of a stratified sequence or an unstratified series for refinement of artifact chronology; (4) revisitation of additional likely sites and likely locations; and (5) selection for more intensive study of representative sites spanning the transition. In view of the poor artifactual diagnostics, cultigen

presence may be a relevant indicator. Groundstone washes for pollen and botanical analyses of hearth and pit contexts should be undertaken. Direct dating of cultigen remains by conventional or tandem accelerator methods are essential. Coprolite, teeth, and human bone analyses should also be undertaken as possible.

Resource Mixes.--The issue of relative resource dependence forms a continuum with concerns surrounding the appearance of cultigens. Some evolutionary schemes order prehistory according to sequential dietary emphasis. Resource combinations resulting from subsistence strategies in particular times and places provide the bases for evaluating not only these broad chronological trends but also the extent and significance of synchronic variety.

Preagricultural societies constitute one subset of study. PaleoIndian subsistence is associated with mobile hunting of large game. The remains of large game species are often visible archeologically, and have therefore often been studied. Research should be equally directed toward alternative site types of the period and their subsistence records. Regional patterns of Archaic resource use across the Southwest are tenuously linked to arrays of utilized species. The rarity of preagricultural sites with potential for subsistence recovery is such that promising cases should be given high priority for intensive study.

Fluctuating resource emphases during agricultural times have been correlated with such factors as population growth, climatic oscillations, and long-term environmental trends. More recently interest has grown in the existence of differing economic orientations and mutualistic relationships among contemporaneous populations (Upham 1988). Realistic evaluation of resource mixtures depends upon the efficacy of comparative techniques. Quantification of subsistence remains is itself problematical. Techniques must be standardized and equivalence in sampling addressed in order to establish reliable contrasts. Additionally, sampling must be coordinated in the quantitative comparison of artifacts, facilities, or space pertaining to resource use.

In single National Forests or in adjacent Forests, contemporary settlements of different cultural affiliations provide an opportunity to examine cultural as well as environmental influence on resource mixes. For cultural segments in similar environments, equivalent sampling can be instituted and the results compared. Incorporation of agricultural and nonagricultural products in a subsistence mix can be then evaluated in terms of environmental opportunities and limits. In addition, culturally-shaped components of strategy affecting this balance should also be illuminated by contrast. According to time, money, and investigator interest, such comparative study could encompass settlement pattern, artifactual distributions, biological remains, catchment shape, or other aspects.

Implements and Facilities.--Nonagricultural implements and facilities of subsistence are spatially arrayed in such a way that they may be treated in the focused study of sites, or are so widely dispersed that they require special recovery methods. On the other hand, the remains of agricultural activities cover substantial portions of the landscape in a wide range of densities. Agricultural technologies and their success provide basic insights into the adaptations of more dense and numerous prehistoric populations and thus may furnish environmental lessons for the present.

Former agricultural fields may be marked by remains of features constructed to enhance crop habitat through water or soil control. These may be accompanied by temporary habitation or storage structures, fieldside processing facilities, and specialized artifact assemblages. These locations also contain botanical remains for identifying crop types and agricultural practices. Such remains are often so widespread that they are difficult to avoid in modern land use.

While identification and preservation of agricultural facilities must continue as a routine Forest management activity, initial studies should be directed toward areas in which other elements of settlement pattern are well recorded. Implements and facilities provide minimal understanding of overall subsistence systems, organization of production, and labor allocation, unless viewed in a settlement context with chronological association (e.g. Crown 1984; Fish et al. in press). A particular research need is new methods of systematic recording able to encompass the variety of forms and distributions of agricultural remains on Southwestern Forests.

Health, Diet, and Nutrition.--Nutrition and health of prehistoric populations is a key element for gauging one kind of success in subsistence strategies, understanding choices among alternative strategies, and assessing the implications of shifts in economic lifestyles. Precontact history of health and diseases can be known only from archeological evidence. The origin and development of New World pathogens and the impacts of Old World types are of particular significance.

Ongoing archeological investigations generate continual data, but many research problems might be approached through existing collections from Forest lands or adjacent areas. Directly relevant materials for examining variables of diet, nutrition, and health are often in the form of human remains. Examinations of bone, teeth, and mummified tissues are crucial to establishing data on stature, nutrition, trauma, mortality, and other population measures, prehistoric medical procedures, and cultural practices affecting the physical states of individuals. Investigative parameters in these instances must be developed in concert with the concerns of Native Americans.

Health and diet outcomes of the transition to agriculture are major current issues. Baseline

studies of nonagricultural populations are necessary. Exciting new methods that assess dietary ratios from bone and coprolite remains offer quantitative estimates of dietary elements. Coprolite studies also offer insight into seasonality of diet, parasitic infections among settled populations, and other factors.

Catchments.--The term catchment is used here in a broader sense than the area sustaining subsistence needs for a single site. Catchments can be defined at a number of increasingly inclusive scales or for highly mobile groups. It is a concept that aids in modeling the acquisition of multiple subsistence resources for any analytical unit of population. Catchment study requires knowledge of distributions of resources and variables affecting resources as well as evidence for specific uses, and extractive and productive activities of the populations being studied. Catchment studies further have implications for intergroup relationships in that they partition the landscape into overlapping, intersecting, or mutually-exclusive human territories.

Catchment investigations are particularly appropriate for Forest research for several reasons. Forests encompass among the least disturbed natural areas, and are suitable analogs for prehistoric biotic conditions and resource availability. Forests continually amass biotic data useful for backgrounds to such study, and possess the technology for their measurement and manipulation. Existing site inventories may be inadequate for some purposes, but could contribute toward data sets for broad studies and permit selection of locations for more focused ones.

A class of catchment study capitalizing on Forest information would be that concerning prehistoric wood use. Catchment areas for firewood, construction, and other uses are known in detail for few areas, although availability or depletion of supplies has been recognized as a potential factor influencing sedentism and specific site locations. A recent Chacoan study by Betancourt et al. (1986) illustrates the organizational aspects of unusually expansive catchments in complex societies. Forest data would be of great benefit in modeling source, labor, transport, sustainability, and many other aspects of prehistoric catchments for wood resources.

Environment

Variability in Time and Space.--While knowledge of the present environments of the National Forests is indispensible to understanding past human behavior, it must be remembered that natural systems are not static. Consequently, modern conditions cannot be used as direct analogues of conditions that confronted the prehistoric human inhabitants of the Southwest. Paleoenvironmental variability must be reconstructed to a level of refinement at least equal to that of the archeological record in order to understand human behavioral interaction with past environmental fluctuations. Recent environmental reconstruction on the Colorado Plateau (Dean et al. 1985, Euler et al. 1979, Gumerman in press) can serve as a starting point for paleoenvironmental research on the Forests.

Two types of environmental variability that represent end points on a continuum of variation are distinguished. Low frequency process (LFP) variability is due to natural processes with periodicities more than 25 years long. High frequency process (HFP) variability is caused by natural processes with periodicities of 25 years or less. The former are recognized chiefly through geomorphic studies of Pleistocene and Holocene alluvium and through palynological analyses of geological deposits. HFP variability is perceived primarily through dendroclimatic analyses of climate-sensitive tree-ring chronologies. These techniques provide information on several important aspects of environmental variation, including amplitude, trend, duration, and temporal and spatial characteristics. These aspects of environmental variability, singly and in combination, can be associated with a range of behavioral responses that can be recognized in the archeological record (Plog et al., in press).

A conceptual model of behavioral adaptive systems (Dean, in press; Dean et al. 1985) specifies the manner in which environmental variability combines with demographic variation and sociocultural factors to trigger systemic change in adaptive systems. While few would assign primacy to environmental variability, it also is true that human behavior in the Southwest cannot be adequately understood without detailed knowledge of past environmental fluctuations. The Southwestern Forests possess the potential for meaningful research into this topic.

Many data needed for this type of research are already in hand. Existing Forest Service information on soils, vegetation, and fauna could be used to calibrate variability in modern conditions with measures of past environmental variations. Many suitable areas exist for geomorphic studies comparable to those achieved by Karlstrom (in press; Karlstrom and Karlstrom 1986) on the Colorado Plateau. Such research would involve detailed stratigraphic analyses of alluvial exposures accompanied by independent dating of the deposits. Analyses of pollen profiles in the many lakes and bogs of the Forests would provide unparalleled data on LFP vegetational fluctuations from the end of the Pleistocene to the present. Palynological and geomorphic estimates of effective moisture and crop production would provide crucial data on agricultural potential through time and space.

A wide variety of HFP variables could be reconstructed through dendroclimatic analysis. Much of this research already has been accomplished or is in progress at the Laboratory of Tree-ring Research at the University of Arizona

(Dean and Robinson 1977, 1978). The primary need at present is to update the climate-sensitive tree-ring chronologies, most of which end at around 1970, through recoring of the original living trees and adding new trees to the data network. An especially promising opportunity exists to contribute to an ongoing study of extremely long tree-ring chronologies suitable for reconstructing several climatic variables over the entire western United States for the last two millennia. Much of the chronology network is already in place: there is a series of more than twenty stations ranging across the Great Basin and the Southwest. Augmenting this network would provide a data grid of unprecedented breadth and depth for the reconstruction of climatic variability throughout the western U.S.

Implementation of the environmental research outlined above would require the services of a project manager who would supervise the activities of Forest Service researchers and cooperating scientists from outside agencies. Reconstruction of LFP environmental variability would require one or more alluvial geomorphologists and the services of several outside organizations to provide the chronometric determinations necessary for dating the alluvial units. Pollen analysis would involve the selection of loci to be cored, execution of the fieldwork, analysis of the samples, and comparison and collation of the resulting pollen curves with one another. HFP environmental reconstruction could best be accomplished through contracts with the Laboratory of Tree-ring Research, which already has completed much of the necessary work. Minimally such an undertaking would involve the collection of cores from trees in selected sites throughout the Forests, data processing, and merging the results with preexisting chronologies to produce the data network. Standard dendroclimatic analyses then would be used to reconstruct various climatic variables such as temperature, precipitation, PDSI, runoff, and others. Comparison and collation of the data from all paleoenvironmental analyses would fall on the Forest Service Project Manager, who would require the assistance of specialists to produce graphic and cartographic syntheses of the relationships among all measures. The result would be detailed knowledge of paleoenvironmental variability across the Southwest for the last 2000 years. Such data not only would benefit archeologists in their attempts to explain past human behavior, but would also be invaluable for studies of floral and faunal variability, forest dynamics, geomorphic processes, and many other natural phenomena.

Resource Data Base.--Human resource data bases for each Forest do not in themselves represent products of problem-oriented archeological research. However, compiled to meet archeological needs, such documents would enhance research capabilities of Forest and non-Forest Archeologists alike. These data bases could be assembled to document distributions of resources from archeological and ethnographic contexts, to describe the current environment from the standpoint of human needs, and to identify historic changes from earlier conditions.

Forests currently monitor and describe climate, physical aspects of the environment, wildlife, and vegetational patterns for management and planning purposes. Additional observations pertinent to archeology might be incorporated through communication between archeologists and other Forest personnel. Ancillary studies to assemble specific archeological data are also necessary. These could include edible and craft-material species, mineral deposits, lithic sources, cave locations, and hydrological, soil, or climatic variables affecting prehistoric and historic agriculture. Locational data on such factors would be critical in catchment analyses and in interpreting subsistence strategies as outcomes of multiple choices among scheduling, labor allocation, cultural preference, risk estimates, and other factors.

Ethnographic Data Base.--Ethnographic data bases could be compiled in conjunction with ones for resources or separately, although both are essential for many research topics. Literature resources exist for most Forests and may pertain to observations and descriptions prior to the memories of living members of traditional groups. Desirable information may be scattered widely beyond purposeful ethnographic accounts in the remarks of explorers, colonists, military personnel, and temporary visitors. Archival research is a valuable means of access to less familiar sources.

Ethnographic data pertaining to subsistence is of management and planning as well as archeological concern, since Native American and traditional groups may currently draw upon Forest resources. In this sense, cognitive mapping of resources by such groups would serve simultaneous information needs. As discussed under a section on Native American heritage, such accounts should be considered at the discretion and direction of the groups in question.

Elicited, volunteered, and literary accounts of resource use are each unique in articulating choice, strategy, preference, and other mentalistic correlates of resource use. Furthermore, such accounts offer optimal analogs for travel, transport, labor costs, scheduling, exchange practices, and other behavioral components of susbsistence systems. Persisting patterns of traditional practices could be integrated with experimental, interpretational, and recreational programs. Examples are demonstration gardens of traditional crops or nature trails emphasizing aboriginal resources and their use.

Site Dynamics

The topics of site formation processes, transformation processes, and observer bias have been treated in some detail by Upham (this volume)

and by Spoerl (this volume). These discussions are based on the work of Upham and Green (1988), and on a host of recent publications following the scientific genre established by Michael Schiffer. Increasingly, archeologists are treating the issues of site formation processes as central elements in the interpretation of both survey and excavation data. We encourage reconfirmation of the research goals identified in the proposal submitted by Upham and Green in 1982 to the National Science Foundation. Resurrection of the research program identified in that proposal, especially with respect to measuring the effects of logging, machinery, grazing, wild and prescribed fires, recreation, and access, should be a top priority of the Forest Service. In addition, research should be implemented to realize Upham and Green's goals regarding the biases introduced into survey records due to differing survey standards, variation in site recognition, site recording, and site collection.

At the time that Upham and Green completed their NSF proposal, the idea of a landscape approach to archeological survey was poorly developed. Consequently, the proposal was structured around the traditional "site" concept, employing the definition(s) used by the Forest Service. Given the recent developments in the landscape-based approach, and the explicit emphasis on that methodology by Sullivan (this volume), Upham and Green's NSF proposal should be revised to reflect these new methodological advances.

A final area of concern is directly related to the process of site formation. Experimental approaches to this problem as defined by Fosberg et al. (this volume) should be undertaken to evaluate potential variability in the occupational and depositional histories of both real and manufactured sites. In addition, historical sites should be used, especially those for which detailed historical documentation exist, to reconstruct the occupational history of specific sites. Fine-grained studies of depositional stratification need to be undertaken on these sites, and detailed comparative and quantitative studies of the artifact assemblages should be completed. In these studies, historical documentation should be used to establish parameters of the occupation, particularly with respect to demographic issues and to details of functional differentiation among structures and use areas of the site.

INTERPRETIVE ISSUES AND TECHNICAL RESEARCH

Chronology

Few archeologists would deny that refined chronological control is essential to their efforts to characterize and understand past human behavior. Indeed, the kinds of research questions that currently occupy archeologists' attention cannot realistically be addressed without such control. A wide array of such questions is embodied in the various aspects of the general issue of the development and decline of social systems outlined above. A successful attack on this problem rests, minimally, on reasonably secure and exact knowledge of the dating of past sociocultural events, temporal relationships among communities, and temporal relationships between activities that take place at residential loci and activities that occur elsewhere. Unless the material remains of past human activities can be accurately and precisely dated, it will be impossible to construct the refined, high-resolution chronologies necessary to produce the required knowledge. Undeniably, then, chronology remains a key research topic for archeology in general, as well as for archeology on the National Forests.

An integrated attack on archeological chronology on Southwestern Forests involves two primary objectives: (1) refinement of independent dating methods; and (2) dating archeological sites that lack independent chronometric assessments. Attainment of the latter depends largely on achievement of the former.

Independent Chronometric Dating

A variety of independent dating techniques have been developed over the past 75 years. These methods span a wide range of variability in terms of accuracy (ability to produce the correct date), precision (ability to replicate results), and resolution (ability to discriminate units of time). Four techniques with the potential to contribute to the above objectives are briefly described below in order of decreasing accuracy, precision, and resolution. These characterizations are followed by a series of research recommendations that apply, first, to chronometric concerns in general and, subsequently, to the individual dating techniques.

Dendrochronology, or tree-ring dating, is accurate to the calendar year, is absolutely precise in that any number of replications will achieve identical results, and is capable of differentiating one calendar year from another. These characteristics have provided Southwestern archeology with the finest prehistoric chronological control in the world. Dendrochronology in the Southwest, however, is limited to contexts that provide datable wood or charcoal.

The accuracy and precision of archaeomagnetic dating are several orders of magnitude below those of dendrochronology. Resolution is only on a scale of decades rather than years. Archaeomagnetism is applicable wherever a dated standard curve of magnetic pole movement is available for comparison. Although the Southwest is such an area, there is plenty of opportunity for refinement of the curve and the resultant dates. Limitations include the necessity for features of iron-rich clay that have been heated to a minimum temperature, and the possibility of

contamination by local anomalies in the geomagnetic field, forest fires, extraneous inclusions, and other factors.

Because obsidian hydration dating is relatively new, its chronometric attributes are poorly known. It does, however, exhibit lower ranges of accuracy, precision, and resolution than does archaeomagnetic dating. Although obsidian hydration has a great potential, inconsistent and contradictory results from controlled dating experiments testify to serious, unresolved problems. Furthermore, application of the method naturally is limited to areas in which obsidian is found. Given the methodological progress to be made and the comparative abundance of obsidian on Southwestern sites, the potential contribution of Forest Service research to obsidian hydration dating is great.

The accuracy, precision, and resolution of radiocarbon dating are so poor that the usefulness of this technique for dating materials less than approximately 2000 years old must be questioned. For material between 2000 and ca. 40,000 years in age, however, radiocarbon dating is the primary chronometric tool around the world. The advent of accelerator-mass spectrometer technology has permitted the dating of small samples, such as individual seeds and twigs, which in turn has rendered events such as the adoption of agriculture directly datable.

Three general chronometric problems could be profitably addressed through coordinated research that involved one or more Southwestern National Forests. These are as follows.

1. Currently available or augmented site survey data could be used to develop provisional site sequences for various localities within Forests or, where appropriate, for individual Forests or even the Region as a whole. It should be realized that such chronologies will be crude and subject to refinement as information accumulates. Nonetheless, such a series of relative chronologies would be of inestimable value in assessing regional aspects of sociocultural development, change, and decline. Among these topics are synchrony and nonsynchrony in local developmental sequences, interareal interaction, exchange, formal trading networks, the spatial scale of settlement and economic systems, and others. This objective could best be achieved through the development of a central, computerized data base that contained archeological and environmental information relevant to the above issues. Extreme care would be necessary to create a data base flexible enough to allow editing of the data, replacement of old data with better information, and the addition of pertinent data. Accomplishment of this goal would create a chronological information system of lasting value to the Forest Service and Southwestern archeology.

2. A coordinated effort could be made to sample and analyze or store exposed datable materials that are vulnerable to natural deterioration or human destruction. Examples are exposed wood or charcoal in prehistoric (cliff dwellings, rock shelters, and vandalized open sites) or historic (recent Indian sites, log cabins, and lumbering or mining features) contexts, and obsidian tools and flakes from contexts likely to be disturbed by human activities. Implementation of this research not only would materially enhance dating control in the Forests, it also would preserve irreplaceable and endangered chronometric resources.

3. One of the major foci of Southwestern archeology is the generation of areal site chronologies that can be used both for the temporal placement of newly investigated sites and as a basis for the investigation of the processes of cultural change and stability. These efforts commonly are hampered by the inability, due primarily to the lack of coordination and funding, to concentrate dating efforts on situations of high chronological promise. For example, contexts characterized by the unambiguous association of datable materials with temporally sensitive artifact attributes often cannot be exploited due to lack of planning for such unpredictable finds. Nevertheless, such instances are immensely important in building local chronologies, for they offer the opportunity to assign better dates to artifact attributes. Development of mechanisms to respond promptly and effectively to such fortuitous situations, collect potentially datable material and detailed contextual data, and undertake the appropriate chronometric analyses would be an achievement of significance and value far beyond the local situation. Such an undertaking would undoubtedly involve partnerships among many federal, state, and local institutions, and might stimulate an unprecedented level of cooperation and coordination among agencies involved in Southwestern archeology.

Only three of the many method-specific studies that could be undertaken are mentioned here. Rather than focus on the dating of archeological materials, these studies emphasize the development and enhancement of methods to improve the results achieved generally by the technique in question.

1. Insofar as tree-ring dating is concerned, exact dating is routinely possible on most Forests. Dendrochronological research could involve (a) dating of specific materials designed to enhance archeological knowledge; and (b) an effort to extend the master tree-ring chronologies farther back into the past to allow dating of older sites. Thus, the Forest Service could mount a project to extract datable tree-ring samples from contexts designed to amplify archeological gaps or from sites that have potential for extending the master sequences.

2. The Forest Service could make an important contribution to archaeomagnetic dating through research designed to evaluate the effects of forest fires on the magnetic character of

potentially datable features. If fires raise the temperature of buried features beyond the critical point, the resultant dates are irrelevant to the site and date, rather, the forest fire. The potential magnitude of this problem could be assessed through the comparison of sites that have been subjected to known fires with nearby sites spared by the same blaze. Alternatively, controlled burns could be used to evaluate fire effects on sites or on controlled test materials placed at different depths.

3. The greatest potential chronometric contribution lies in the domain of obsidian hydration dating. While the promise of this technique to deliver high-quality dates is great, it is beset by many uncertainties. Resolution of these problems depends in part at least on better control of the variables that affect hydration rate and on experimental tests designed to compare obsidian hydration results with those of other chronometric techniques. Both approaches could easily be implemented with the resources available to the Southwestern Forests. The proximity of major obsidian sources to the Forests would facilitate collection of raw material for investigating the physical and chemical variability of this material. Forest lands encompass a variety of environments that could be monitored over a period of years to disclose the variability in factors that affect the hydration rate. The wide range of sites in the Forests could produce obsidian samples of varying ages, degrees of exposure, and ambient conditions; these could be used to study site-context effects. Finally, the Forests possess excavated contexts in which obsidian co-occurs with dendrochronologically-, archaeomagnetically-, and historically-dated materials that can serve as standards for calibrating the obsidian hydration dating system.

Intrinsic Dating

A major theme of contemporary archeology is the study of human behavior on regional scales of analysis. It is commonly held that the operation of human sociocultural systems can be fully understood only if interactions among populations across broad areas can be described and explained. Perhaps the most vexing impediment to refined archeological analysis on large geographic scales is our inability to provide high-resolution dating of sites that lack independent chronometric determinations. Until this shortcoming is eliminated, efforts to handle the issues of regional-level interaction, exchange, and political interrelationships will founder on the inability to demonstrate site contemporaneity and to establish synchroneity among local developmental sequences. Forest Service research could make no greater contribution to Southwestern archeology than to make serious inroads into this debilitating problem.

Southwestern archeology is routinely, and accurately, touted as having the finest prehistoric chronological controls in the world. Nevertheless, the uncomfortable truth is that the vast majority of sites lack chronometric dates that allow exact temporal placement. This is particularly true of sites known only through survey, but applies also to many excavated sites. Since most regional analyses rely primarily on survey data, interspersed with information from the occasional excavated site, the chronological problem becomes acute. Given the relative paucity of tightly-dated cases, dating generally involves the use of time-sensitive attributes of objects or materials that are abundant on sites. As throughout the world, the chosen objects in the Southwest are lithic tools for preceramic types and pottery for later contexts.

The general practice is to work out sequences of change in time-sensitive attributes based on contextual and stylistic relationships, and then to calibrate these sequences against measures of absolute time, that is, independent dates. In the Southwest, three approaches to calibration have been employed. The first, developed by pioneer archeologists such as Colton, Hargrave, and the Gladwins (Colton and Hargrave 1937; Gladwin and Gladwin 1934; Hargrave 1932), involves the use of ceramic types defined on the basis of consistent combinations of technological and stylistic attributes (Ambler in press; Beals, Brainerd and Smith 1945; Christenson 1988). The second focuses on the temporal characteristics of decorative styles (Carlson 1970; Wasley 1959). The third relies on visual or mathematical seriations of individual design elements and element configurations (Plog 1980; Plog and Hantman 1986).

Most Southwestern ceramic chronologies, either type- or attribute-based, are calibrated, directly or indirectly, against tree-ring-dated points of association. In areas where such dates are lacking, other independent techniques have been used. The resolution of ceramic chronologies is a function of the interval between independently-dated points in the sequence, coupled with the rates of change in time-sensitive attributes. It should be emphasized that the dated points are not necessarily evenly spaced and that the rates of ceramic change are not necessarily constant. Resolution is augmented by reducing the interval between dated points either by adding more points or by seriating ceramic change between points.

Obviously, a myriad of interfering variables beset ceramic attribute calibration and dating. One of these is the character of various independent dating techniques, as described above. Only three of these methods - dendrochronology, archaeomagnetism, and obsidian hydration - are likely to have a resolution superior to that of ceramic attributes themselves, and therefore to be usable in calibration. The behavior of the people who produced the archeological remains introduces a host of uncertainties into the calibration and dating situations. The rate of change in ceramic attributes, for example, undoubtedly varied across time and space, even within types. Differential

use of vessels and sherds, such as for cooking, serving, storage, water transport, burial goods, wall chinking, and pottery firing, introduces nontemporal variability into the picture. The existence of heirlooms, long distance trade, and differential access to ceramic goods further perturb the situation. Behavior associated with the abandonment of residential loci, which is known to vary widely across the Southwest, also affects the ceramic component. Post-occupational natural and behavioral processes and events that impinge on sites further alter the original chronological information present at site abandonment. Finally, aspects of the present archeological situation affect dating potential. Methods for defining time sensitive attributes are still crude. Even more crucial is our general ignorance of the degree to which material on the surface of a site represents the totality of that site.

The key to resolving the calibration problem is the nature of the association between time-sensitive ceramic attributes and the materials that produce independent chronometric dates. Control of these associations in excavated contexts is vital to the assignment of accurate dates to points on the ceramic continuum. The resolution of the ceramic dating system depends on the number and distribution of such dated points. Maximizing the number and spread of such points will determine the utility of ceramic dating for regional analyses. Control of the various interfering variables is crucial to the dating of individual sites, the arrangement of these sites in the proper order, and the assignment of calendar dates to temporal units.

The Southwestern National Forests are uniquely suited to mount an intensive attack on the problem of "undated" site chronology. The thousands of sites representing a wide range of sizes, functions, ages, exposures, and environments provide a data base ideal for a systematic investigation of this problem. Ceramic attribute sequences for different areas, habitats, and site situations can be developed using available site inventory information supplemented by additional data relevant to this problem. Enough well-dated ceramic associations exist to provide a sufficient number of independently-dated points to assign initial dates to the sequences. Refinement of the chronology would involve identification of weak points, gaps, and inconsistencies that could be remedied by the excavation of sites carefully selected for relevant ceramic attributes and a high probability of containing materials suitable for independent dating. The improved chronology could then be further refined through iterations of the process until no further improvement was achieved.

Concurrently with the above chronological research, experiments relating to control of the various interfering variables could be conducted efficiently and easily with resources available to the Forests. Careful analyses of surface remains, coupled with controlled excavation, could elucidate the relationship between surface and subsurface remains, and materially improve the dating of unexcavated sites. Studies of ceramic type and stylistic attribute distributions across space and site types could reveal the nature and scale of time lags between areas and sites due to differential access to, or distance of, trade. The study of obsidian hydration outlined in the previous section should be integrated into the research proposed here. In addition to its value in calibrating ceramic chronologies, this method could be used for the direct dating of sites, both ceramic and aceramic, on whose surfaces obsidian occurs. Finally, studies of sites subjected to different postoccupational natural processes (erosion, deposition, forest fires, etc.) and human activities (logging, chaining, mining, road building, pothunting, vandalism, and a host of others) would elucidate the effects of those variables on site dating.

The chronological research suggested here represents a finite study that could be completed, at least in pilot form, in five years or less. In addition to a research coordinator, one or two specialists in ceramic analysis would be needed to perform the typological and stylistic analyses of the pottery. Another specialist would be needed to develop and operate computer programs for handling the site and ceramic data. Lacking curated site collections, carefully selected samples of sites representing a broad range of variability could be used for collection of the ceramic data necessary for seriation. Initial assignment of dates to points on the ceramic sequences could be accomplished on the basis of excavated data already available. Refinement of the ceramic chronology would involve limited excavation in carefully selected sites and the incorporation of new information from work unconnected with this project. Evaluation at several stages of the research would help assess progress, reveal problems, and identify procedural changes necessary to maximize progress. Five years into the project, it should be possible to release a provisional, high-resolution ceramic chronology that could be applied over a fairly extensive region by a variety of research projects. Such a chronology would allow a wide range of regional-scale studies that previously had been difficult or impossible to implement.

RESEARCH PERSPECTIVES FROM THE LINCOLN AND SANTA FE NATIONAL FORESTS

Archeologists in the Southwestern United States have identified and refined various local and regional cultural-developmental sequences for the prehistoric period. These cultural sequences apply to areas within the states of Arizona and New Mexico, including the eleven National Forests that make up the Southwestern Region of the U.S. Forest Service. The territories in which prehistoric cultural groups carried out their activities sometimes overlap present day National

Forest boundaries, but each National Forest also contains cultural manifestations unique to that particular Forest. Thus, the prehistoric cultural remains on each of the Region's eleven National Forests provide a unique vehicle whereby the key prehistoric topics identified and outlined by Upham (this volume) may be investigated. It is likely that cultural resource data from any of the Region's National Forests could be used to address, to some extent, any of the research topics, but given the variety of cultural manifestations on the various Forests, data from one Forest will probably be more appropriate for a particular research topic than from another Forest.

The following section examines opportunities for investigation of key prehistoric research topics from the perspective of two of the Region's National Forests: the Lincoln and the Santa Fe. By focusing upon these two Forests we do not intend to suggest that research concerning cultural developments in the prehistoric Southwest ought to be limited to these Forests. They are used only as examples of the kinds of research that might be pursued on any of the Region's Forests.

Before discussing research opportunities presented by the cultural manifestations on the Lincoln and Santa Fe National Forests, it is important to point out that only limited portions of both forests have been surveyed for cultural resources. Less that five percent of the Lincoln has been surveyed, while the figure for the Santa Fe is less than fifteen percent. Similar low figures apply to all of the Region's Forests.

There are also problems with the data bases on all Forests, which render them a less-than-ideal tool for undertaking investigations of the research topics identified by Upham. In the ten- to fifteen-year existence of cultural resource management in the Southwestern Region, the Region's site inventory form has undergone several changes. As a consequence, data from those sites inventoried in the early stages of the program are less complete than the data gathered more recently. In addition, there has been no particular principle guiding the collection of data; the inventory form provides for a limited amount of descriptive, environmental, and managerial data but without any specific focus. Thus it does not lend itself well to investigations of any specific research topic. Over the years, site inventory has been carried out by archeologists and para-archeologists with widely varying levels of experience. Often, inventory is accomplished by temporary personnel, and there is continual turnover in positions of this nature. As a result of these circumstances, there is considerable inconsistency, or observer bias, encoded into Forest data bases. How pervasive this problem is likely varies from Forest to Forest. Finally, cultural resource inventory in the Southwestern Region has been tied almost exclusively to project clearances. This linkage has resulted in very uneven coverage of the land area within each Forest, such that there are major areas on many Forests that have little or no data recorded. This is particularly true of Forests with active timber management programs. Here, we have considerable data from timbered areas at high elevations, but generally poor coverage in other areas. Despite these problems, however, it is felt that extant data bases can serve as a vehicle for preliminary sorting of sites into categories that would be useful in addressing the identified research topics.

Lincoln National Forest

The Lincoln National Forest is located in the highlands of south-central New Mexico. The Forest covers approximately 1.1 million acres extending from the Texas-New Mexico border on the south to the community of Ancho, New Mexico on the north. Included in this geographical area are three major mountain ranges: the Sacramento, Capitan, and Guadalupe Mountains. Vegetation is diverse, ranging from desert-scrub associations at approximately 4000 feet above sea level to alpine meadows and spruce-fir forests at over 11,000 feet in elevation. Two streams, the Rio Hondo and Rio Penasco, originate on the Forest and flow eastward into the Pecos River. Most smaller streams are confined to the Sacramento Mountains.

The Forest has been the scene of human activity for thousands of years, although no large aggregated villages or dense population areas seem to have developed. Archeologically, the Forest falls within the Jornada Branch of the Mogollon.

No firm evidence for PaleoIndian occupations has been found on the Forest, but it is likely that all prehistoric cultural periods from PaleoIndian through Apache are represented (Spoerl 1983). The Archaic Period is the first occupation on the Forest that has been documented. Archaic remains have been found in the Guadalupe and Sacramento Mountains, in rock shelters and on ridges, primarily in the pinyon-juniper zone. Most of the sites that have been assigned to this period were done so based on projectile point chronologies. Few absolute dates have been obtained.

Sometime prior to A.D. 700, the Jornada Branch of the Mogollon developed in southeastern New Mexico. This period is marked by the first appearance of pottery and villages, and is well represented on the Forest. Sites include small artifact scatters and rock art sites located throughout the Forest, villages in the Sacramento and Capitan Mountains, and large ring middens or fire-cracked rock features associated with artifact scatters in the Guadalupe Mountains and southern Sacramento Mountains. The villages appear to have been largely abandoned by the late 1300s or early 1400s, perhaps signaling a return to a more mobile existence.

By the 1700s or earlier, the Sacramento Mountains became the homeland of the Mescalero

Apaches, who dominated south-central New Mexico for the next 200 years. It is unlikely that the Mescaleros were responsible for the abandonment of the Jornada Mogollon villages: such an early date for their arrival has not been demonstrated.

The Data Base

Over 700 cultural resource surveys have been conducted on the Lincoln National Forest over the past 15 years. Currently, approximately 45,000 acres, or 4.1 percent of the Forest, have been surveyed. The majority of the surveys were located in commercial timber areas above 8000 ft. in elevation. These surveys have resulted in the discovery and documentation of 693 sites, all of which are contained in the computerized data base. Most of the sites date from the Jornada Mogollon period (Johnson, Fulgham, and Reed 1988).

As noted above, these surveys were conducted primarily in response to the need for cultural resource clearances for Forest Service undertakings, and do not represent a statistically valid sample of the Forest. Other shortcomings of the data base have already been pointed out. Nevertheless, this data base contains information on 693 sites and can be helpful in arriving at answers to a variety of research topics.

Research Opportunities

To date, very little research has been conducted on the Forest, outside of obtaining clearances for undertakings. Some excavations have been conducted, primarily in the 1930s (Mera 1938; Roberts 1929) and a few large surveys have been undertaken (Roney 1975; Beckes et al. 1977). These studies provide some general information and limited interpretations of sites located on Forest lands. The Lincoln, then, is in need of research to explain the cultural behavior that left the remains found on the Forest. Such research would aid in the interpretation of cultural resources for the public as well as the scientific community, and would assist in the management of this resource.

The Lincoln National Forest covers a major portion of the upland areas occupied by the Jornada Mogollon and other groups throughout the prehistory of southeastern New Mexico. The limited information available on the cultural resources of this area has severely hampered the understanding of the cultural past of this portion of the state. Research conducted on the Forest would fill in some important gaps in the overall interpretation of the cultural resources of southeastern New Mexico in general.

Upham (this volume) presented a series of key prehistoric research themes for the Forests in Region 3. For consistency, these topics are discussed below in terms of addressing some of the research needs of the Lincoln National Forest.

Agriculture and Subsistence

A variety of subsistence data are available on the Forest. Numerous rock shelters in the Sacramento and Guadalupe Mountains contain well preserved organic remains. Early dates associated with corn were obtained from Fresnal Shelter (Carmichael 1983). Other cultigens were identified there as well (Bohrer 1972). It is likely that similar remains are present in other shelters in the area, and would help to address questions concerning the adoption of agriculture or the use of other cultigens during the prehistoric period. Agricultural facilities and implements have rarely been found on the Forest. Possible erosion control or runoff diversion features were noted near some Corona Phase sites in the northern portion of the Forest (Reed 1987). Other features undoubtedly exist, but will have to await further survey to be identified.

Stuart and Gauthier (1981) noted that the variety of corn found in Lincoln Phase sites near the Forest was an older variety that may have been better suited to upland environments. This variety persisted until later periods than elsewhere in the Southwest, even though other varieties were being grown nearby in the Tularosa Basin. Further research into the types of corn grown in the area, and the implications of different varieties grown in upland areas, should be explored.

Demography

Research into population size, density, and distribution on the Forest will require further surveys and site recording guided by a statistically valid sampling design. Such a program has been proposed for the Forest (Higgins and Johnson 1987; Johnson, Fulgham and Reed 1988). The completion of the sample survey of the Forest will, however, take several years. Upon completion, the resulting data base will allow for research into demography as well as many other topics.

Settlement

This research theme must also be addressed through more controlled survey, site recording, and chronometric dating. The current level and distribution of surveys on the Forest will allow for only general statements concerning settlement characteristics (e.g., Spoerl 1983). Stuart and Gauthier (1981) have pointed out apparent shifts in the elevation of Jornada settlements in the Sacramento Mountains through time. This would have to be verified through further field research. The Jornada Mogollon occupation of the Forest has been characterized as highly mobile and resilient. Investigation into the impetus for sedentism on Forest lands would contribute to the understanding of how the Jornada Mogollon adapted to environmental and cultural pressures.

Settlement pattern studies would also help to explain the relationship between the upland sites and those located in the basins below.

Labor

Research into the organization and management of labor will be difficult to pursue for PaleoIndian and Archaic sites without considerable additional field work. Only 25 Archaic sites have been identified, and as noted above, no sites can be definitely assigned to the PaleoIndian period. Drawing information from the remaining sites will also be difficult. Most of these sites consist of artifact scatters with no associated features or structures.

Notable exceptions are the sites with midden rings or mescal roasting pits commonly found in the Guadalupe Mountains. These large fire-cracked features often exceed eight meters in diameter and can be up to one meter or more in height. A tremendous amount of rock had to be gathered and manipulated during the construction of these features. In some cases, the rocks appear to have been selected for color as well as size. Such selection, coupled with the labor invested, suggests that a great deal of management and organization of labor may have been involved.

These features are found in large numbers throughout the Guadalupe mountains and appear to span the late Archaic through Apache occupations. Research into their construction, the differences between some of these features, and the labor involved in their formation could help to identify differences in or continuity in labor organization and management through time.

Economy

Economic research promises to provide a variety of data important to the Forest. Investigations into exchange, for example, as reflected in variability in ceramic types, trace-element analysis of ceramics, or stylistic similarity and variation could help to explain the relationships between the Jornada Mogollon on the Forest and other neighboring groups. Interaction to some extent with Casas Grandes, the Mogollon areas to the west, and the Anasazi to the north is generally accepted, but the extent of the interaction cannot be determined without further research. Similar studies using obsidian artifacts, such as trace element analysis and stylistic analysis of obsidian tools, should also be undertaken. Although obsidian is not common on the Forest, obsidian artifacts have been found, and the research results could provide data on the economies of Archaic groups as well.

Environment

Paleoenvironmental data pertinent to the Forest have largely come from a few studies that have been conducted in nearby areas (see Camilli and Allen 1979). The most direct evidence comes from packrat middens in the Guadalupe and San Andres Mountains. There have been no tree ring or pollen analyses on the Forest. A research program that would provide more comprehensive environmental data would not only help to explain cultural reactions to environmental change, but would also be useful for understanding the past climate and its effects on timber, range, and the other forest resources.

Site Formation Processes

This topic is discussed in more detail in another paper in this volume (Fosberg et al.). The treatment here is limited to noting that investigations into site formation and transformation processes such as alluviation and erosion would be particularly appropriate for the Lincoln, and would help to identify the effects natural processes have on the archeological data base. Such research would aid in the discovery of sites in alluviated areas of the Forest, and help in the evaluation of the integrity of sites in areas subject to frequent erosion or other transformation processes.

Definition of Culture and Adaptive Diversity

The emerging notion that Southwestern societies developed organizational strategies that were extremely resilient and flexible to allow for adaptation to changing natural and social environments is directly applicable to the Lincoln data. Research along this line, however, will necessarily require more intensive surveys, better chronological control, and detailed investigations of sites, environmental conditions, and other factors before progress on the Forest can be made. Once the Forest data base has been expanded to include a more representative sample of the sites and there is a better understanding of the cultural landscape, this research will be highly productive.

Archeological Visibility

This research theme addresses the problems inherent in relying on large sites and elaborate architecture in interpreting past occupations. Small, low density sites comprise a major portion of the archeological record that has been all too often overlooked. The sites on the Lincoln primarily fall into this category, and present an opportunity to examine this type of cultural remain and determine its part in the overall settlement pattern. The low occurrence of large villages on the Forest provides a situation where the majority of the small sites have not been obscured or consumed by the larger sites, as might have happened had large aggregated villages formed in areas previously utilized by highly mobile populations.

Chronometric Dating

Many researchers in the Jornada Mogollon area have relied on relative dating to assign sites to the various phase sequences that have been proposed for the region. Several researchers have pointed out the problems inherent in relying on relative dates for this area (Cordell and Plog 1979; Upham 1984; Carmichael 1983, 1985; Reed 1987), and have called for more emphasis on absolute dating. Few chronometric dates have been obtained for sites on the Lincoln National Forest. As a result, the cultural sequence is poorly understood and temporal diagnostics are inadequately dated. A program for the collection of more dates is a high priority, and a limited approach to address this problem for the Forest has recently been implemented (Johnson, Fulgham, and Reed 1988). A much larger program of dating sites is necessary to adequately resolve the problem. A more refined chronology and accurate dating of sites will tie directly into the other research topics and will prove to be vital in the interpretation of cultural remains on the Forest.

The nature of the cultural resource base on the Forest limits, to a certain extent, the types of dating techniques that can be successfully applied. Obsidian is rare, and usually consists of surface finds. There is also a lack of exposed roof beams, and the nature of the structural remains on the Forest have left few suitable remains for tree-ring dates. Further excavations may yield other specimens suitable for dating.

Discussion

This brief discussion of the research topics proposed by Upham serves to illustrate how such topics apply to the Lincoln National Forest. All of the topics are important avenues of investigation directly applicable to the cultural remains found on the Forest. Some are more important than others, and many will involve overlapping studies to address adequately the questions being asked. Research along virtually any of these lines will result in important and long-awaited data necessary for understanding the behavior responsible for producing the cultural resources of the Forest, and interpreting these remains and the activities that formed them for the public. This research would also meet the need of management to know the locations and range of the cultural resource base, and to understand the importance of these remains for future generations.

Throughout this discussion, it has been apparent that two major issues continue to arise. One is the lack of adequate survey coverage for much of the Forest. This results in an inaccurate picture of the cultural past, and a failure to provide a representative sample of the cultural resources on the Forest. The other issue concerns the inability to assign most of the sites that have been recorded to a specific temporal period. By addressing these two issues in a research program, the data provided would result in a data base from which other more detailed and complex research questions can be addressed.

The nature of the current cultural resource management program on the Forest is such that most of the data needed to address the research questions will be slow in coming. Without a research program, sites will continue to be discovered, avoided, and set aside with only a basic idea of how they fit into overall cultural systems, and a backlog of unevaluated sites and vague interpretations of the past will continue to be the norm. The potential of this Forest resource to benefit the public, management, and the scientific community will not be realized. Only through a dedicated research program will cultural resource management break out of its reactive mode, and cultural resources will attain a level of recognition and importance long overdue from management and the public.

Santa Fe National Forest

The Santa Fe National Forest contains approximately 1.5 million acres, and is located in central to north-central New Mexico. It is divided into two major portions, generally separated by the Rio Grande River Valley and the present day communities of Espanola and Santa Fe. Each of the two separate portions is centered on forested upland areas that lie to either side of the Rio Grande Valley. To the east is the southernmost extension of the Sangre de Cristo Mountains, while the western portion is dominated by the Jemez Mountains. Water courses that originate in both mountainous areas generally feed into the Rio Grande River, although there are notable exceptions, such as the Pecos River, which flows southward from the Sangre de Cristos.

The cultural resource management program on the Santa Fe Forest was effectively initiated by 1977/78. To date about 200,000 acres have been intensively surveyed, although considerably more acres have been sampled to various degrees. Some 4500 cultural resource sites, most of which are prehistoric, have been formally inventoried. The resultant data have been entered into an electronic data base, although physical site-form files are also maintained. It is estimated that the entire Forest contains from 30,000 to 40,000 cultural resource sites. Prehistoric site types include artifact scatters, trails, shrines, soil/water control features, rock art, field houses, "towers," pithouse villages, and pueblos ranging from a few up to several thousand rooms. Temporally these sites range from late-middle Archaic up to the time of initial contact with the Spanish in the mid-16th century.

Archaic sites appear to have a limited geographical distribution in the northeastern portion of the Jemez Mountains along the Rio Grande and its tributaries (e.g., the Chama River). This limited distribution may be more apparent than real due to uneven survey coverage.

Following Archaic times it is generally believed by archeologists that there was a low level of human occupation in the Forest area until the latter part of Puebloan times, i.e., until the late 1200s. An exception to this is the Gallina area, where substantial occupation is recorded beginning around A.D. 1000 to 1050. The apparent lack of Basketmaker and early Pueblo occupation is almost certainly a function of inadequate survey coverage. We simply have not looked in the appropriate places.

Most known prehistoric sites on the Santa Fe Forest are moderate- to large-sized pueblos surrounded by thousands of field houses. They are located mostly on the Pajarito Plateau and on several large mesas in the southern portion of the Jemez Mountains near the Jemez River. These sites are representative of late Puebloan developments (i.e., post A.D. 1250). An additional substantial portion of the known prehistoric sites on the Forest are in the northern reaches of the Jemez Mountains in the Gallina Culture area. Characteristic sites here are small, dispersed villages containing various combinations of pithouses, small surface structures, and "towers." A few cliff dwellings are present in the area. Dates for Gallina occupation range from about A.D. 1000 to 1250.

Cultural manifestations located within the Santa Fe Forest can provide data relevant to virtually all of the key prehistoric research topics identified by Upham (this volume), although the particular manifestations and remains on the Forest can be used to address some of the topics more appropriately than others. Actually the treatment of these topics as separate areas of research is largely artificial and heuristic. Human behavior occurs within cultural-systemic contexts, and although one can define economy and technology, for example, as separate elements for purposes of analysis, the various elements of human behavioral systems are inextricably functionally interrelated. One would not expect to find a technological assemblage appropriate to a densely concentrated sedentary agricultural society being employed by dispersed small mobile groups subsisting mainly upon hunting and gathering. The technology of the latter group would be expected to be appropriate to their particular level of complexity and their adaptive strategy. In other words, their technology would be functionally interrelated and in keeping with other elements of their adaptive system.

With this perspective as a framework, cultural manifestations on the Santa Fe Forest provide an opportunity for research focused upon the question of functional interrelatedness of social systems and the development, persistence, and collapse of such systems. It is assumed here that the nature of the interface between a human social group and the physical environment is conditioned by or is a function of the level of technological, sociopolitical, and organizational complexity characteristic of the group. Such research can be approached through the comparative method, an approach which was developed and extensively employed in the early days of anthropology as a newly emerging area of social science inquiry. The geographical focus of such research would be the Jemez Mountains, which can be regarded for purposes of analysis as relatively homogeneous with regard to physical environment. Within this setting, social systems of differing levels of complexity developed, persisted for a certain amount of time and then gave way to later social systems. Research in the area should compare these social systems to one another in an attempt to understand why differing systems developed as they did, through what processes they were able to persist, and what conditions or circumstances led to their eventual replacement by later systems. The focus would be upon culture process and structural/functional variability in different systems.

The high elevation, forested uplands of the Jemez Mountains provided some portion of the subsistence base as well as some economically important resource materials for late Archaic populations. It is assumed, although not yet demonstrated, that high elevation areas (over 7000 feet) did not provide for the entire subsistence base of these populations. Such groups are thought to have been relatively mobile, and high elevation areas were probably exploited as one part of a seasonal round that included utilization of lower elevation riverine settings. We actually know very little about Archaic Period occupation and utilization of the Jemez Mountains, and many basic data remain to be gathered. It is essential that more inventory be carried out to determine the distribution of Archaic sites and that initial research be focused upon dating of Archaic sites. (See below for a discussion of the potential for dating sites in the Jemez Mountains.) The framework for data gathering should be structured with subsistence, demography, settlement, labor requirements, economy, and environment as principal elements.

As mentioned above, it is felt that sites representative of Basketmaker and early Pueblo times are present in the Jemez Mountains, although extant archeological literature suggests otherwise. Although there is limited evidence that the archeological literature is incorrect, there is a need for additional inventory. Data gathered through inventory should focus upon relevant research topics. An ability to assign sites to specific time periods during inventory would be essential.

Archaic utilization of the Jemez Mountains contrasts rather markedly with use of the same general area by Puebloan peoples several thousand years later. One element of research on the Santa Fe Forest should be a comparison of these later developments with those of the Archaic Period. The majority of research should focus upon a comparison between the Gallina culture which developed in the northern portion of the Jemez Mountains during the A.D. 1000 to 1250 period on the one hand, and subsequent though partially

overlapping developments in the Pajarito Plateau and Jemez River areas on the other. These contrasting, almost contemporaneous social systems occupying environmentally comparable niches afford an excellent opportunity for comparative research involving the relationships among subsistence, demography, settlement, labor requirements, and economy in social systems at differing levels of complexity.

As noted above, the areas around the Jemez River and the Pajarito Plateau are characterized by numerous moderate- to large-sized pueblo sites surrounded by thousands of small (one and two room) limited activity sites, many of which are assumed to be field houses. These site complexes date in the period from the A.D. 1200s up to the mid-1500s. There is also demonstrable continuity with Puebloan peoples living in the same general area today. By contrast with Archaic populations, these late Puebloan peoples were concentrated into relatively restricted areas, and maintained a fully sedentary way of life based on a predominantly agricultural subsistence base. The sites in the Jemez River area represent one of the highest-altitude, primarily agricultural adaptations known in prehistoric North America. One of the largest pueblos here is located at 8000 feet. Field houses have been recorded at elevations up to 8400 feet.

A number of the research questions identified by Upham could be fruitfully investigated with data contained in these sites. We need to determine how important agriculture was in the overall subsistence system. To what extent did they rely upon agriculture? What was the range of cultigens? It would also be an ideal situation in which to conduct research regarding the environmental tolerance of various cultigens. What level of labor investment was needed in construction and maintenance of the large pueblos found here, as well as the thousands of field houses? What level of labor investment was necessary for pursuit of an agricultural lifeway in general? The remarkable quantity of field houses is itself an ideal topic for research. Other predominantly agricultural Southwestern societies did not adopt the field house on such an extensive basis. Is there some inherent element in this high elevation setting that promoted or necessitated this particular approach to agricultural practices? How important was exchange in maintaining their social system, and what goods and services figured into their exchange networks?

In the 1000s to 1200s, the Gallina Culture flourished in the northern Jemez Mountains, perhaps in part contemporaneously with occupations in the southern part of the mountain range. This prehistoric culture is characterized by numerous scattered, relatively small hamlets, with individual sites being comprised of various combinations of pithouses, small surface structures, and the poorly understood Gallina "tower." The Gallina are also thought to have been agriculturalists, but the relative importance and extent of reliance on agriculture are not presently known. For research purposes the Gallina should be contrasted with Jemez-area Puebloan developments in terms of the relative importance of agriculture in their overall subsistence systems, the range of cultigens grown, the environmental tolerance of their cultigens, and the technology adopted to facilitate their pursuit of agricultural practices. These various elements should be considered in the light of the markedly different organizational postures of the two systems. These were nearly contemporaneous groups who occupied areas sufficiently close and comparable in elevation to be considered environmentally equivalent. They were quite dissimilar in population size and density. This contrast presents an ideal research opportunity to investigate the postulated relationship between population size and density on the one hand, and the degrees of sociopolitical complexity, subsistence intensification, and social stratification on the other. The labor investment necessary to maintain the Gallina system appears to have been substantially less than that of the Jemez River system. We know almost nothing of exchange relationships among the Gallina or between the Gallina and other groups.

Further opportunities for prehistoric research on the Santa Fe National Forest are presented by the potential for dating archeological sites with relatively little effort or monetary investment. Being in a forested area, prehistoric peoples throughout the Jemez Mountains made considerable use of wooden beams in construction. Wooden beams are currently visibly exposed in a number of large pueblos as well as in some field house structures. A program is currently under way to collect dendrochronological samples from these exposed beams and have them dated. No doubt large numbers of additional sites contain wooden beams that are datable through dendrochronology. Establishment of a well-dated developmental sequence in the Jemez Mountains area is a very real possibility. Establishment of such a sequence is considered an essential first step before one could effectively pursue the research discussed above.

Besides the potential for dating through dendrochronology, the Jemez Mountains are the location of two major Southwestern obsidian exposures, the Jemez Mountains source and the Polvadera Peak source. Obsidian is found on sites throughout the Jemez Mountains and is known to have been widely traded in northern New Mexico during prehistoric times. Although there are various problems and pitfalls with the technique, obsidian artifacts and debitage can be dated through obsidian hydration layer measurements at relatively small costs. In the Jemez Mountains such dating could initially be carried out in conjunction with dendrochronological dating for the Puebloan period. This linkage between the two techniques of dating should lead to better definition and eventual resolution of problems inherent in the hydration dating technique. If the reliability of obsidian hydration dating could

be raised to an acceptable level, we would have an excellent means of dating Archaic sites in the Jemez Mountains and elsewhere. This would vastly increase our knowledge and understanding of Archaic period developments, and make it possible to compare these developments with those of later time periods in a more meaningful way. An ability to date sites through low-cost obsidian hydration studies would open up many avenues of future research.

RECOMMENDATIONS FOR IMPLEMENTATION

The increased emphasis on cultural resources research in the Forest Service requires a revised structure to plan and manage for the future use of the Forest's data base. Cultural resources research can no longer be managed on a Forest-by-Forest basis, relying on the already overburdened Forest Archeologist to develop, plan, and implement the kinds of detailed research envisioned in this document. Instead, the existing Forest Service Research Stations should assume responsibility for cultural resources research activities.

Of course, management problems are not resolved by establishing the home of cultural resources research in the research stations. Chronic under-funding of Recreation vis-a-vis other budget line items would create a difficult situation for research station managers, if they assumed full responsibility for cultural resources research at that level. Consequently, additional funding and additional staff are needed to implement the plans for cultural resources research in an effective manner.

Presently, the Rocky Mountain Research Station receives about $140,000 annually for Recreation research. This amount would be insufficient if it was all allocated for cultural resources alone. A beginning point to implement the broad-based program of prehistoric research would be to raise the level of funding for cultural resources research to $720,000 per annum over a five-year period. Perhaps the lion's share of this amount, maybe $500,000, could be allocated directly to the cultural resources research program. This figure would represent the same proportion of FY 1988 dollars presently allocated to Recreation in the Rocky Mountain Research Station, if the total annual budget for Recreation were raised to $12,000,000. The present Recreation budget totals $2,400,000. These new dollars would be allocated according to a prioritized research plan established by the Directors and Assistant Directors of the Research Stations. Such a plan would be informed by the input of professionals outside the Forest Service, and by Forest Service personnel directly involved with cultural resources management.

Prioritized Research Objectives

The difficulty of prioritizing research cannot be over-estimated. Research deemed as critical by one group of scientists may be viewed as outmoded or (worse) doctrinaire by others. As the Forest Service research program is initiated, it is imperative that basic research be identified that is, in a sense, research-neutral. By research-neutral we mean research that does not align itself with any single interpretive position, or foster the appearance of research that has been canalized by narrow theoretical or methodological views. Consequently, the prioritized research objective identified below, and the budget and staff recommendations contained in our previous discussions, are fundamental to all research and management problems.

Chronology

Without question the current top priority for prehistoric research in the Southwestern Region is directly related to the issues of chronometric dating techniques and site dating. As revealed in our previous discussions of this issue, no single research topic is as fundamental to all basic archeological research as is work related to dating and chronology construction. At the present time, many different research questions related to the development and collapse of social systems (see Upham, this volume) cannot be addressed because of inadequate precision in existing chronologies. Other research issues too are impeded by chronological problems (e.g. duration of artifact types, site occupation spans, etc.). Finally, some aspects of the chronometric techniques themselves are poorly understood, and research needs to be completed to answer important technical questions.

Our recommendation to the Forest Service is to use the discussions contained in the section on chonology in this paper to identify research questions for study during the next five years. We believe the total funding effort for prehistoric research should be devoted to the subjects we have described.

The Role of Contract Research In the Extramural Research Program

Many of the research issues identified in this chapter and in that by Upham require scientists and investigators to make research commitments over the long term. Archeological problems often require years of careful field and laboratory work to resolve, and increasingly that research is relying on sophisticated technical instrumentation and high technology applications. One result of this new condition of archeological research is that agencies and institutions are forced to make investments in expensive equipment, thereby increasing overhead and decreasing flexibility to respond to a more broadly based set of research issues. From an institutional standpoint, the systemic result has been toward increasing specialization and the formation of laboratories and research teams with narrowly

defined goals. Within the framework of the Forest Service research stations, this alternative is undesirable.

Consequently, it is advisable from both a policy and procedural standpoint to contract cultural resources research, especially that involving high technology applications, whenever possible. The extramural research program should begin by compiling information on the qualifications of various laboratories and research teams that might be used in the future. Awards should be made on a competitive basis either as responses to RFPs or, in selected cases, as IFBs. Under no circumstances should the policy of low bid apply in the evaluation of proposals.

Monitoring of contract-related research is critical for maintaining quality in the overall Forest Service research effort. Specific Forest Service personnel should be designated as points-of-contact for each contract project. Ideally, the Forest Service contact should have some expertise in the contract area. If such personnel cannot be obtained, then an outside consultant should be retained to monitor the progress and quality of work being performed.

Partnerships and Cooperation

We believe that the Forest Service should establish a region-wide program whereby key academic institutions and scientific facilities are identified to assisted in the planning, implementation, and review of the research program. Specialists from many different fields can be contacted for guidance on key research issues. Academic institutions and scientific facilities that possess key technical equipment should be contacted, and a program of cooperation and cost-sharing should be explored. In return, the Forest Service could facilitate the conduct of research on the National Forests by key investigators at these institutions. Of course, the kind of cooperative program envisioned here would facilitate the sharing and dissemination of cultural resources research.

Peer Review

It is expected that peer review of long-term research plans would occur prior to the initiation of the research program. Management review of the program would also occur within the framework of budgeting on an annual basis. It is also expected that peer review of proposals submitted in response to contract offerings would take place (perhaps using the model of the TPEC, or Technical Proposal Evaluation Committee). These three uses of peer review are common in most, if not all, research programs. We encourage, however, an additional element of peer review in the Forest Service research program. This review process would occur on a biannual basis by outside personnel (academicians or non-academic specialists), and would be directed at assessing the overall research effort. Such review would include, minimally, evaluation of long- and short-term research objectives, analysis of past, current, and pending research in light of these objectives, and recommendation of revisions or additions to the existing plan.

The last element of the fourfold model of peer review described above will ensure continued credibility of the Forest Service research program with the professional community, and will discourage perceptions that the Forest Service has established a closed research shop or is too closely linked with a given group of researchers or ideas. Maintaining this standard of credibility will permit greater flexibility in research over the long-term, and will serve as a vehicle for comprehensive evaluation of the research program and its objectives both within and outside of the Forest Service management framework.

CONCLUDING THOUGHTS

Archeology, like science in general, has as its primary goal and raison d'etre the advancement of knowledge, in this case the knowledge of past and present human behavior. Research as a management tool represents an important, but nonetheless secondary, function of science. Superficially, the subject of key prehistoric research seems only tangential to the management aspects of archeology, and to relate almost exclusively to the first aspect. However, the management of "cultural resources" can be approached from the perspective of the first aspect if archeological remains are viewed as scientific resources, that is, as sources of information useful in furthering knowledge.

The "scientific resource" perspective localizes criteria for archeological resources mangement in the scientific value of the resources rather than in their "cultural" value. The scientific value of such resources is not immutable, but changes as science itself develops. Thus, management criteria can be expected to evolve along with the science of archeology. This approach to resource allocation may at first glance seem antithetical to the management approach. This need not be the case, however. The approach advocated here is directly analogous to that used in accumulating data for the wise management of natural resources. Just as the proper management of mule deer or spotted owls rests on knowledge of the behavior of these animals, so the most effective management of cultural resources depends on knowledge of the behavior of the humans who produced the sites. Despite this conceptual identity, the focus of the research differs between the natural and archeological domains. While the behavior of deer and owls can be directly observed, the behavior of prehistoric humans can be only indirectly observed through the material remains of their activities. Nevertheless, the fact remains that, however indirectly achieved, knowledge of past human

behavior is vital to understanding and managing Southwestern cultural resources. For example, knowledge of the land-use practices of a past population can be more useful for the management of cultural resources than objective data on sites in the target area.

Misconceptions about the nature of cultural resources and of archeology hamper the implementation of effective management programs based on either the scientific or management aspects of archeological research. Archeology comprises at least two major components, description (prehistory) and explanation. The "library" analogy advanced at this conference (Muniz, this volume) is not totally inappropriate for conceptualizing the descriptive mode of archeological research. It is remotely conceivable that a point can be reached where everything that can be learned archeologically about the prehistoric human events of an area has been learned. Attainment of such a position would complete the ultimate volume of the library on the prehistory of that area.

The "library" model, however, is not compatible with the explanatory mode of scientific research. No matter how much is known about the prehistory (description) of an area, archeologists will never cease trying to explain the behavior that produced the prehistory. New theories of human behavior and of the relationship of that behavior to material remains, new research questions generated by theoretical developments, and new technical methods will engage archeologists in a perpetual round of examination and reexamination of their data. Consequently, there will always be a need for an intact archeological data base.

Consideration of the "scientific resource" approach to management and of the dual nature of archeological research lead inescapably to the conclusion that all archeological sites are significant relative to current or future research orientations. Therefore, the preferred cultural resources management strategy is the complete protection of all sites for all time at all costs. Obviously, though, such approach to management would be totally impractical, and is not advocated here. Clearly, some compromise must be reached between the needs of archeological research, for either management or knowledge,and effective management of Forest resources in general.

Fortunately, a compromise that eliminates the need to make all-or-nothing decisions about allocation of cultural resources is possible. This allocation strategy responds to both the descriptive and explanatory modes of archeological research and to management realities. It is based on the scientific view that sites are and always will be sources of scientifically-useful information. The proposed strategy promotes the conservation of archeological information and involves the distinction between protection (keeping sites from harm) and preservation (keeping sites from change). Scientifically, there is no justification to preserve all sites from the natural entropic processes of degradation. This type of site transformation is part of the archeological domain. Furthermore, attempts to preserve sites often obliterate or render inaccessible the scientific information they contain. Thus, preservation should be infrequently employed and then primarily for educational (display) rather than scientific purposes. In contrast, the protection of sites from inadvertent or purposeful damage by humans is a legitimate concern. Passive protection involves avoiding sites whenever possible so as to preserve their archeological integrity. Active protection involves efforts to control and eliminate pothunting, vandalism, and other intentional assaults on the archeological record. In cases in which impacts can be neither avoided nor circumvented, a procedure of preservation through study should be invoked. This means that all possible information should be extracted from imperiled sites before they are disturbed or destroyed. Detailed documentation, surface collection, or excavation can preserve valuable information on the sites in the form of materials and data. Encouraging extramural research on endangered sites would be a cost-effective means of accumulating such information.

The allocation strategy outlined above is based on the precept that knowledge of the resource is the key to wise management. Two kinds of knowledge are involved. Empirical information on the archeological record based on inventories and analyses of survey data constitute one kind of knowledge. The other involves understanding the human behavior that produced the cultural resources, and is directly analogous to the use of knowledge of animal behavior to manage faunal resources. In this strategy significance is determined as much by knowledge of past human behavior as by the empirical characteristics of the archeological record. This represents a "proactive" rather than reactive approach to the allocation of cultural resources.

To conclude, the proposed cultural resources allocation strategy focuses on the protection rather than the preservation of sites. Protection can be achieved through the avoidance of sites whenever possible, coupled with an active vandalism-suppression program. When avoidance is impossible, or when natural processes threaten destruction of important data (perishable items, for example), a policy of preservation through documentation should be followed. Endangered sites should be recorded in detail, associated materials should be collected and stored, and, in cases of imminent destruction, the sites should be excavated. This approach would preserve valuable information that could be used by future generations of archeologists. In this way, at least some aspects of sites permanently removed from the cultural resources research base would not be lost but would be conserved for posterity.

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The Spanish Colonial Research Center Quincentenary Project: a National and International Model for Cultural Resources Management and Interpretation Research[1]

Joseph P. Sanchez[2]

The Spanish Colonial Research Center is a joint project between the National Park Service (NPS) and the University of New Mexico. The Center was established to assist the National Park Service in its preparation for the Columbus Quincentennial in 1992. The Center's mission, to collect and analyze Spanish Colonial documents, will result in long-lasting benefits to the National Park Service. Much of the data base will be used to upgrade exhibits, publications, and audio-visual scripts at NPS sites, as well as for training of NPS personnel. In addition to the development of the documentary data base, the Center has cooperated with the Spanish Ministry of Culture in Madrid on a two-year research project, and has exchanged ideas with the Spanish National Commission on the Quincentenary (Madrid) and the Committee for "Expo 92" (World's Fair) in Sevilla. In June 1988 the Center, working with the University of New Mexico and the Fundacion Xavier de Salas (Trujillo), will co-sponsor a symposium entitled "Primer Encuentro entre Extremadura y Nuevo Mexico" at Trujillo. The symposium is funded by the Comite Conjunto Hispano-Norteamericano in Madrid.

The Center was established as a Service-wide research program in 1986 on the University of New Mexico campus, Albuquerque, New Mexico. Organizationally the Center receives its direction from the National Park Service Columbus Quincentennial Task Force administered by the Associate Director, Cultural Resources, Washington, D.C. Administratively, the Center coordinates NPS Quincentennial Research Requirements through the Regional Director, Southwest Region, Santa Fe, New Mexico. As the only unit of the National Park Service that exclusively addresses the research needs of Spanish Colonial Heritage sites and related matters, the Center works closely and cooperates with the Office of the Vice President for Community and International Programs at the University. A Memorandum of Understanding, signed in the summer of 1987, enables the Center to coordinate its research activities with UNM faculty and students. In association with the University, the Center provides additional opportunities for national and international scholarly exchanges.

Materials in the Center's collection date from the Age of Discovery. The collection includes documents useful for research regarding Columbus' second voyage, and his discovery of the Virgin Islands or Puerto Rico. Furthermore, the documentation covers a chronological period from 1492 through the early 1800s. The distinctive writing styles of Spanish Colonials and historical situations within these various time frames present a challenge for researchers of Spanish Colonial California, Arizona, New Mexico, Texas, Louisiana, and Florida.

Documents in the Center's collection are representative of Spain's 328-year administration of the empire's northern frontiers. They are primarily from the archives in Sevilla, Simancas, and Madrid, Spain, and Mexico City. These depositories contain millions of Spanish Colonial documents. For instance, the archive in Sevilla houses approximately 40 million pages of documents, and another 30 million pages are housed at the archive in Simancas. The oldest archive at Simancas contains documents related to the early history of the Americas. The Archivo General de Simancas was founded soon after Columbus' third expedition. The archive is comprised of the various files from secretaries or counsels who advised the king on the empire's administration. For the sake of improved record keeping, it was decided to house all documents in one place.

Mexico City's national archive is estimated to house several million pages of documents. This does not take into account documents in various provincial archives, such as those in Sonora, Chihuahua, or Coahuila. Large numbers of documents also exist in the other states and in private collectors' archives throughout Mexico. The documents contain records of the Spanish Colonial administration of natural resources. These documents reveal that Spanish explorers recorded in their maps, plans, sketches, diaries, and correspondence information regarding land, climate, resources, and people. Colonialism is given a new meaning in light of these revealing records.

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[1] Paper presented at the Forest Service Cultural Resources Research Symposium (Grand Canyon, May 2-6, 1988).

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In order to assess the significance of Spanish Colonial Heritage sites, the Center stresses a comparative colonialism as a perspective. Colonialism in the United States is usually defined from the English point of view. It is assumed that English Colonialism spawned democracy; however, democracy is the antithesis of colonialism. English Colonialism must be viewed in its proper perspective. This can be accomplished by examining the history of British expansion from the Caribbean to India. Likewise, modern-day French Colonialism in Algeria offers the history student one of the most tragic examples of colonialism. Today the vestigial colonialism of the South African situation is analogous. Present-day Western Civilization is still overshadowed by colonialism in more ways than is realized. Our world is perceived in terms of a colonial and neocolonial approach. Spanish Colonialism is misconstrued in many ways, primarily because of the cruelty of conquest associated solely with the Iberian expansion. Yet French, English, German, and Portuguese Colonialism did not much differ from Spanish Colonialism. However, existing documents on Spanish administration in the Americas inspire a completely different impression.

Maps, plans, sketches, and other documentation in Spanish Colonial archives are an asset for exploring the past. Aside from physical and topographical land features, documents reveal locations of many natural resources, as well as the locations of native populations. Colonials exploiting raw resources found this knowledge invaluable in meeting their needs for a cheap labor force. As a result, a colonial-native relationship was formed wherever Spaniards settled. Valuable insight is gained from these documents on colonial-native relationships and the exploitation of raw resources.

Spanish Colonial maps reveal where rivers, mountains, pasturage, salt-deposit zones, and minerals are located. Rather than communicating place names and the shortest route from point A to point B, Spanish Colonials seemed preoccupied with conveying relevant information related to natural resources, and with locating low-cost native labor forces.

The knowledge acquired from the cartographical collection at the Center reveals the extent of Spanish Colonial interests in North America. For example, an 1819 map depicting all lands north of Santa Fe - northern New Mexico and Colorado - indicates the range of the Spanish Colonial sphere of activity in the northern edge of the empire. A particularly interesting physical feature included on the 1819 map is the Yellowstone River. Also, attached to the map are a series of documents describing the Yellowstone country, and a 1819 plan proposed by Facundo Melgares of Santa Fe to lead an expedition to the Yellowstone country as soon as the "weather warmed a bit."

Similar documents are available for many areas of North America. Georgia and Florida are just two examples. Other examples include the Caribbean, the lower South, the Southwest to California, and the far north to Alaska. All of these areas were considered part of the Spanish domain.

The Spanish Colonial archives also contain documents related to the American Revolution. Documentation includes interviews by Spanish officers with American officers in order to determine the status of the American cause. Letters reveal interviews with George Washington in his tent headquarters, as well as those held with British commanders at their headquarters.

Spaniards also mapped many strategic areas during the American Revolution. These include maps of various Revolutionary War battle sites. Some examples of mapped areas are Philadelphia, Charleston, and Boston. Therefore, it seems reasonable that National Park Service American Revolutionary sites could unite with Columbus Quincentennial efforts in a way that would permit a unique type of interpretation. After all, the French are interpreted at English Colonial sites, so why not examine the Spanish efforts along those lines? Besides these records of Spanish Colonial ventures in North America, there are also maps, plans, and sketches on the American Westward Movement that the Jefferson National Expansion Memorial would find very interesting. Indeed, plans of the fortification of St.Louis, Arkansas Post, and New Orleans offer a view to the past which can assist archeologists as well as historians in their Quincentenary research projects.

The Spanish Colonial Research Center with its growing collection of 20,000 pages of microfilmed documents, transcriptions, and translations is project-oriented. Its site-specific research is aimed at preparing the National Park Service for the Quincentenary in 1992.

Archeology of the Ephemeral: Research Themes for Western Historic Sites[1]

George A. Teague[2]

Abstract.--Historical archeology is defined, and its trends and traditions are described. Dominant research themes are extracted. Applications for these themes are suggested within the context of Forest Service land management.

In this paper I will summarize the state of research in historical archeology, provide a list of current research themes, and touch upon ways historical archeology might apply to Forest Service properties in the Southwest.

The primary problem in dealing acheologically with historic period sites is what I call the "Oh Yeah" syndrome. Even when line managers have become sensitive to their legal responsibilities to archeological sites, it takes some prodding to get them to say, "Oh yeah. There're also some old adobes and mines out there. You don't care about those things, do you?" They can't really be blamed for this. A variant of this attitude emerges even among the archeological fraternity. I can remember, to my shame, running surveys as recently as the early 1970s and giving historical sites exceedingly short shrift in my eagerness to get to the "real" archeology. Even today, a typical survey report pays loving and seemingly interminable homage to prehistoric cracked rocks, then finishes off with an "Oh Yeah" appendix on historical sites. Historical archeology is still something of a stepchild. Nonetheless, with the burgeoning of the Cultural Resource Management (CRM) movement in the mid-1970s, the framers of law and policy wisely included historical sites along with prehistoric sites. We have, then, the obligation to give tin-can archeology the same level of treatment that we give to prehistoric ruins. The question, of course, is what to do with piles of broken glass, old wall footings, and mine shafts.

To put this in perspective, I'm going to give a brief history of historical archeology, and extract some of the trends and themes that have informed it. But first some definitions and scene-setting. The term "historical archeology" has been around in more or less its present form since the 1930s (see Woodward 1937), but has meant many things to different people. The early emphasis on historically significant sites (like Jamestown) led to use of the term "historic sites archeology" (Harrington 1952:336). But eventually, the term was felt to be overly restrictive, and the rubic "historical archeology" was adopted after heated debate (Anonymous 1967). The squabble over terms may seem academic in retrospect, but led to the important distinction that all sites of the historic period were worthy of attention, not just the Jamestowns and St. Augustines. An early definition by Fontana has it that the archeology of historic sites is:

> archeology carried out in sites which contain material evidence on non-Indian culture or concerning which there is contemporary non-Indian documentary record (Fontana 1965:61).

Fontana was referring to sites of the New World, and his concern was strong regarding the relationship of newcomers to the native inhabitants. Other definitions have followed, but Fontana's remains the best, being specific enough to cover the kinds of sites that have been investigated.

The beginning of the period of interest coincides with the arrival of the first Europeans. The end of the period is more oroblematic. It would seem reasonable to put no limitation on the upper end of the sequence. It is easy to forget that the archeology of the Late Victorian Period was a novelty in the 1960s (see Fontana and Greenleaf 1962; Brose 1967), and the archeology of the 20th century was unheard of

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until the 1970s (see Adams 1977; Brown 1978). Both are now commonplace. Furthermore, methodological issues, enthoarcheology, and studies of modern material culture have been pursued using very recent sites. In common practice, however, there is an unspoken consensus that about AD 1930 marks the end of the period of interest in mainstream historical archeology. This may be because of the rule of thumb that normally excludes sites less than 50 years old from consideration for nomination to the National Register of Historic Places unless there are special conditions of significance. In fact, it is a piece of CRM folklore that managers love to bulldoze 49-year-old buildings to avoid the agony of having to deal with the miserable things. I'm sure these tales are apocryphal.

Now I'd like to ask what kinds of sites historical archeologists investigate and, needless to say, I'm going to answer my own question. I conducted my own personal straw poll by looking at about 150 substantive journal articles and monographs published in the last 20 years, and seriating the site types and site ages by date of publication. What I came up with was that historical period Indian, fur trade, and colonial sites are now less frequently excavated than before. Mexican period sites are now more frequently investigated. Interest in American military sites continues unabated. Attention to homesteads, urban domestic, antebellum Black, and industrial sites has been on the increase during the last 10 years, and reporting on these site types now dominates the literature in absolute, as well as relative, terms.

As for the central period of interest, earlier sites, that is those of the colonial period, were excavated in disproportionate numbers prior to 1970, and continue to be reported on to some degree, perhaps out of sheer rarity value. Likewise, the years 1850-1875 encompass the American Civil War and the frontier Indian campaigns, and interest in sites of this period remains high. The real surprise is that excavation of sites of the late Victorian period and the early 20th century has increased considerably, while excavation of earlier sites has decreased in frequency. This may be due in part to ascendancy of the "new social history" which places value on the history of the ordinary man. Also, sites that would have been ignored in years past must now be assessed and treated equally in the course of CRM projects.

Now to get down to specifics about the Forest Service holdings. On the New Mexico properties, at a rough estimate, as much as a fifth of the historic period sites may date from earlier times: that is, protohistoric and historic Indian occupations, or Spanish Colonial and Mexican Period occupations. In Arizona, the number of early historic sites is likely to be even less. The remaining sites will date to the so-called "American Period," lasting from the 1840s to the present. I would venture to guess that the great majority of historic sites in southwestern Forests will date to the late 19th and early 20th centuries, coincident with the coming of the railroad, homesteading, and the quickening of American industry and its needs for ore and timber. This puts things in a new perspective. Rather than the intrinsically interesting and far-removed colonial sites, what we will most often encounter are the remains of ranches, mines, and homesteads. We will most often be doing the archeology of the recent and commonplace, not the old and exotic. And most of the sites will have been ephemerally occupied. Our scope of interest must perforce be directed to failed towns, played out mines, abandoned logging camps, and hapless homesteads. To understand what to do with these I'm going to summarize the five major traditions in historical archeology, and extract the themes that characterize each.

While there were some early stirrings of interest in digging up historic sites (see Schuyler 1975; Deagan 1982), the real start of the discipline can be traced to the 1930s, and this start can be linked to the legacy of historicism. Massive federal work-relief programs of the 1930s proved an unexpected boon for the monuments and heritage interests. The era began inauspiciously with enthusiastic but erroneous reconstructions at a number of sites. The purpose of the restorationists was primarily to provide more by way on interpretation for visitors as well as to stabilize crumbling architecture. As a consequence, sometimes-bewildered archeologists, trained as prehistorians, found themselves digging for historic architectural and locational information. In some lamentable instances, digs were conducted primarily to fill museum cases.

There were, however, landmark studies that transcended the limits of pure historicism. These included excavations at Jamestown, Awatovi, and La Purisima Mission in California (see Cotter 1958; Montgomery and others 1949; Schuyler 1975:64ff). These studies were marked by the discovery of new excavation methods and artifact chronologies. The monuments orientation was continued through the years at such places as Fort Raleigh, Williamsburg, and Brunswick Town (see Harrington 1952, 1966; South 1964), with further refinement in research techniques and artifact analysis. Perhaps the most noteworthy achievement was that anthropologically trained archeologists began to treat historic properties as conceptual analogs to prehistoric sites, in terms of analytical strategies.

By the 1950s, archeologists were chafing under the restraints of the monuments and heritage movement, and had assumed the larger role of "filling in the gaps" in the historical record. They were aided in the endeavor by a new influx of money earmarked for the River Basin Survey project, which was spent on the salvage excavation of a number of forts and trading posts in the Midwest (Mattes 1960). The major advance of this period was the recognition of low-visibility sites, although history and archival research still served to drive the studies.

The salvage movement persisted through the 1960s and early 1970s, when it was transformed into CRM. Extensive description still characterizes the reporting on salvaged sites, but advances in methodological sophistication are regularly grafted on. In fact, it is now impossible to distinguish a good salvage report from one prepared for other reasons.

As new concepts in historical archaeology presented themselves, so were needed new typological and methodological constructs. A number of ways were found for the pragmatic application of low and mid-order quantitative techniques such as linear regression, seriation and cumulative graphing. Manipulation of artifact attribute frequencies has become the hallmark of modern historical archeology; if there is one thing everyone knows about historical archeology, it is that clay pipestem diameters give dates through seriation. Historical archaeology is in fact probably academia's leading consumer of the battleship-shaped curve.

In addition, over the years artifact analysis was wrested from the hands of antiquarians and art historians. Taxonomies on all aspects of historic period material culture have been developed empirically from recovered materials, and chronologies have been developed on the basis of stratigraphic relationships. Thus, cross-regional comparisons may now be made. Analysis has been marked by increasing use of statistical techniques, and other techniques from prehistory, such as faunal and pollen analysis.

Historical archeologists have also gone beyond the bounds of history and into the realm of anthropology. As early as 1951, Gordon Vivian asked questions about past social processes (Vivian 1964). He wanted to know why Gran Quivira was destroyed while other similar pueblos survived and prospered. His findings led him to believe that culture contact and subsequent population mixing resulted in a lack of group social integration. Consequent internal dissension left the group ill-equipped to deal with environmental deterioration and pressure from nomadic populations.

There were soon to follow other examples of social reconstruction, particularly in the areas of assimilation, ethnicity, status, and settlement. The seminal study in this regard was Deetz's (1963) investigation of the Mission La Purisima at Lompoc, California. Deetz assumed the dominant mechanism of acculturation to be missionization. The proposition was tested by examining differential loss of native material culture. Deetz hypothesized that, as a result of missionization, there would be a loss of male-related items of indigenous technology, such as chipped stone tools, and the retention of female-related items like milling stones and comales. There would also be replacement of many other items in the aboriginal repertoire with items of European technology.

In distinction to Deetz, Deagan (1973) rejected the importance of the mission system as an agent of acculturation among the Florida Indians. She argued that it was the mechanism of mestizaje, the marriage or concubinage of Indian women with Spanish soldiers, that provided the "most viable channel of exchange of cultural elements" (Deagan 1973:57).

Other arguments to explain culture change, but taking economics and trade as prime movers, were Irwin-Mason's (1963) study of the Creek, and Deetz's (1965) well-known study of Arikara sites.

Archeological studies of ethnicity have centered on the discovery of artifact patterns, activity sets, or assemblages that allow differing historic ethnic groups to be recognized in the archeological record (see Schuyler 1980). In the East, a number of studies have focused on discovery of Afro-American patterns (for example, Otto 1984; Baker 1978; Deetz 1977a). Sites once occupied by slaves or Free Blacks are distinguished from Euro-American context by evidence of differing access to goods, food, and housing; less participation in national market systems; the presence of differing units of measure (12 foot rather than 16 foot spacings); and differing serving and eating assemblages. Similar studies are being conducted at Chinese sites on the West Coast (for example, Teague and Shenk 1977; LaLande 1982).

Studies of status spring naturally from consideration of ethnicity. Joan Geismar (1982) linked the social disintegration of a Black community to the decrease in status of certain high-ranked individuals. She traced this change in status by examining the relative value of pottery found in deposits of differing age and association. Fortunately, in historical archeology you can sometimes learn how much a set of dishes cost at the time they were bought (see Miller 1980). Similar status-linked studies have been done by analyzing bone and determining the relative costs of meat consumed by differing households (for example, Mudar 1978). In other words, were people eating steak or hambone soup?

Interest in patterns of settlement as they relate to the landscape has always been present to some degree in historical archeology. It is a rare report that doesn't deal with settlement patterns at least at the site level. However, beginning in the 1980s, historical archeologists have been borrowing locational models from the prehistorians, who in turn have often borrowed them from cultural geographers, social historians, and economists (for example, Paynter 1982, Lewis 1976). Thus we now see the whole array of Thiessen polygons, nearest neighbors, and world systems imposed on unsuspecting historic sites. Models have also been borrowed from cultural ecology, with varying degrees of sucess (see Hardesty 1980-81; Kornfeld 1983).

Over the last ten years there has been considerable preoccupation with the development of some sort of theory unique to historical archeology. In 1977, two remarkable books appeared, South's (1977) Method and Theory in Historical Archaeology and Deetz's (1977a) In Small Things Forgotten. By coincidence, two influential (and ultimately competing) approaches had arrived on the scene at the same time. South argues for the merits of "pattern recognition studies" of material culture, while Deetz advanced the idea of "mind set," also presumably recognizable in material culture. Both are materialistic, in the sense that both look to artifacts and architecture for clues to the past, but the approaches are clearly different conceptually, with one proceeding from the ground up and the other from the mind down, so to speak. South considers himself an evolutionist, while Deetz pays homage to structuralism of the French variety. There has been much flailing about by others in search of a theoretical hook upon which to hang these ideas.

Pattern recognition studies are an attempt to order artifacts into functionally related groups (kitchen, arms, architecture and so on). Suites of artifact groups are then set up as temporal/typical models. These models are compared in terms of frequency variation with those from other regions in order to delineate functional, temporal, or behavioral differences between sets. South has distinguished two kinds of patterns. The spatial variety has to do with distinguishing types of waste disposal within a site. The Brunswick Pattern is one of trash disposal directly at points of entrance and exit of buildings in 18th century British sites. It is thought to be a diagnostic site-type marker, in a manner of speaking. Other patterns are recognized on the basis of intra-assemblage variability. The Carolina and Frontier patterns establish norms and ranges of artifacts for various Colonial British military and domestic sites. The patterns establish a yardstick by which other sites may be measured for function and identity. The two patterns co-vary, especially in frequencies of kitchen- and arms-related artifacts.

Deetz's mind set approach was anticipated by Leone (1973) and was given initial direction by the work of Glassie (1968, 1975). Leone (1973) studied the layout of Mormon communities of the Little Colorado drainage of Arizona. He argued that building and fence layout reified and reinforced an ideology concerned with strict equality within a communal system; redemption of the earth; replication of an idealized environmental view; and demarcation of the sacred and the profane. In a later study Leone (1977) considered the cosmological aspects which dictate the construction features of Mormon sacred architecture.

Glassie (1975) studied folk housing in Virginia for evidence of changes in vernacular architecture which could be related to shifts in world view. The Glassie program applied a form of structuralist grammar (called "architectural competence"), whereby any form can be transformed by generating new forms based on the transformational rules. Glassie extracted what he considered the basic form of the British Colonial housing tradition, the 16-foot living unit. Housing was seen to grow by multiples of the basic unit in tightly structured ways. Also valued by the early American builders were bilateral symmetry, tripartite building divisions, and provisions for individual privacy. These elements were thought to reflect a new, rational order which extended to other aspects of life.

Deetz accepted Glassie's conclusions, perhaps because they coincided so well with the idea of "mental templates" which he had promulgated earlier (Deetz 1967). Deetz, in his 1977 book, looked into changes in the form and function of material culture in early New England, with special attention to floor plan, placement of windows and doors, and inventories of eating and serving utensils. He found an apparent change from communal eating and sleeping arrangements, to individual dishes and divided symmetrical floor plans in later periods. Following Glassie, the ideological component to account for these differences was considered to be a change from Medieval to Georgian mind sets (or world views) about the place of the individual in society. The later, Georgian, penchant for symmetrical order is considered to have been unconscious, but nonetheless pervasive throughout the culture.

There have been numerous criticisms of both pattern and mind set approaches. Regardless of criticisms, both pattern studies and mind set studies are with us 10 years after their introduction and, in fact, serve as rallying points for most methodological debate in the discipline today. The pattern approach is seductive; it is something we can actually do, and the heavy quantification attendant upon it is attractive to the science-minded. Mind set studies are equally seductive in their intuitive appeal. Hypotheses brought forth simply make sense, regardless of the fact that they are nonfalsifiable, and hence ultimately untestable. Handsman (1983:65) states that "no matter how much one tries, one cannot put Deetz and South together." On the contrary, the two approaches seem in many ways to be the same thing in different guises: an attempt to find the reason for order in the material world. Deagan used both approaches at St. Augustine, as did Fawcett (1983) for a variety of other sites, demonstrating to me that the approaches are not only compatible, but are operationally identical. Thus far, though, pattern recognition and mind set studies remain methods in search of theory. The parallels with the Configurationalist school, as exemplified by Benedict (1932) are, however, worth noting. As Benedict "emphasizes a culture's strain to consistency" (Harris 1968:401), so too do Deetz and South. We may be excused for imagining a rebirth of the Configurationalist approach in their work.

To sum up, there are five overlapping traditions in historical archeology. We proceed from the monuments and heritage movement to historical description, to anthropological

systematics, to social reconstruction, to pattern studies. It is interesting to see that, since World War II, historical archeology has recapitulated the 100 year history of prehistoric archeology, beginning with an obsession with museum specimens, and ending with a search for overarching theory. However, there should be no supposing that these approaches have scaled some sort of evolutionary pinnacle, nor less has a consensus been achieved. Instead, each of the major traditions persists at present to serve one or another of the various Balkanized provinces of the field.

There are several research themes that can be extracted from the traditions of historical archeology.

1. The strong survival of historicism, which involves locating and identifying monuments and historically notable sites. Also involved is the rather humble enterprise of "filling in the gaps" in the historical record.

2. Refinement of methods, techniques, taxonomies, and chronologies, especially as it involves construction of empirically derived models and using the historical record as a check.

3. Concern with reconstruction of past social systems. The dominant subthemes are studies of assimilation, status, ethnicity, settlement, and subsistence.

4. Search for a unifying theoretical synthesis, as exemplified in materialist and cognitive pattern recognition.

Having said all that, I want to introduce my own view about the directions historical archeology should take. My viewpoint is not only biased, but is out of the mainstream of thought within the discipline. It may, however, serve as a springboard for discussion. As a starting point, I want to refer to Deetz (1977b) who has argued that archeology in general may be evolving into a discipline concerned with the "science of material culture" regardless of temporal context. Furthermore, South has taken the radical position that productive historical archeology can be done in the absence of history, if necessary. He notes that material patterns discovered at historical sites "...may well have absolutely no historical counterpart; indeed mutually exclusive data sets from the historical and archeological records almost appear to be the rule rather than the exception" (South 1977:326). This is also my impression, and leads me to the following observations:

1. Historical sites are best seen as broad arrays of material culture, subject to the extraction of statistical patterns. These data can be synthesized to produce a kind of fact having a truth of its own at least equivalent in value to historical truth.

2. It follows that there is little conceptual difference between treating historic and prehistoric sites. Most of the same standards and techniques may be applied.

3. For that matter, the difference between doing prehistoric and historical archeology is insignificant. Both are forms of reconstructive history and retroactive ethnography (see Deetz 1988; Young 1988 for discussion).

Now, if you accept these tenets, you are compelled to believe that our job is not to be a handmaiden to history, nor to furnish detail to people who want only to rebuild historic forts. Rather, our job is to locate historic period sites and assess them in terms of their potential to inform us about the past. This is where the research themes come in. From a management point of view, our first task is to determine if sites on Forest Service land are useful for pursuing meaningful research questions. However, I am strongly opposed to development of a laundry list of acceptable research themes. In this there is the danger of masking real variability and ignoring social and structural complexity in the past (see Anderson 1985). And there is also the uncomfortable knowledge that dominant research themes will without doubt change in years to come.

To conclude, there are those who feel that other aspects of historical archeology are of importance as well. There are issues of site preservation and interpretation, the role of archival research, and the public's desire for tangible, physical connections to the past. I assume that others will take up these banners in this symposium. But I feel that the most pressing managment need at the moment is the need to know what we have in our public landholdings, and what it's worth, so that informed decisions can be made about site treatment.

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Toward the Creation of a Research Work Unit[1]

Joseph P. Sanchez[2], George Teague[3], James T. Rock[4], David M. Brugge[5], David Siegel[6], and Scott Wood[7]

The following model presents the Forest Service Southwestern Region and the service area of the Rocky Mountain Forest and Range Experiment Station with a feasible program for conducting historical research for the benefit of cultural resources management, general forest management, and future interpretation. The format of the plan, which calls for the creation of a Research Work Unit, includes a rationale, objectives, list of suggested topical areas for research, methodologies and techniques, and estimated staffing and funding requirements.

RATIONALE

As the nation's second largest land-managing agency, the U.S. Forest Service has a preeminent part to play in the Federal historic preservation effort. Although the inventory of our public lands under Forest Service jurisdiction is far from complete, systematic studies conducted within the last several decades have established that the National Forests embrace a prehistoric and historic resource base that may be unparalleled among the primary Federal agencies. This is particularly true in the Southwestern Region, which contains what is probably the best-preserved record of human history and prehistory in the National Forest System.

In keeping with the leadership role of the Forest Service in cultural resources management, and in furtherance of its legislative mandates to identify, preserve, and enhance prehistoric and historic values, it is proposed that a new Research Work Unit be established within the Rocky Mountain Forest and Range Experiment Station. The Research Work Unit would be composed of two principal sub-divisions, a prehistoric work unit and a historic work unit. It would function as a professional scientific, historical, and curatorial facility that would be devoted to: (1) providing professional support for management of prehistoric and historic resources; (2) consolidating and directing Forest Service research needs in the area of prehistoric and historic resources; (3) ensuring that Forest Service management of these resources is consonant with National preservation goals; (4) serving Forest Service planning needs; (5) ensuring and maximizing public interpretation of cultural values on Forest lands; (6) furthering scientific research and meeting the standards and expectations of professional communities, and (7) facilitating compliance with legal requirements, departmental policies, and directives. Models of the kinds of work that the Research Work Unit, as well as National Forests, could undertake are shown in figure 1 and tables 1 and 2.

The Research Work Unit would function as a support service to all Regional, Forest, and field divisions, and provide assistance when requested to other federal and state agencies, institutions, and private concerns. This support could be obtained through the RWU or shared services with other agencies.

OBJECTIVES

The objectives which derive from the Rationale include more specific goals to provide Forest Service management with information necessary to manage and interpret historic resources. Specific goals are:

1. Conduct substantive research that lends itself

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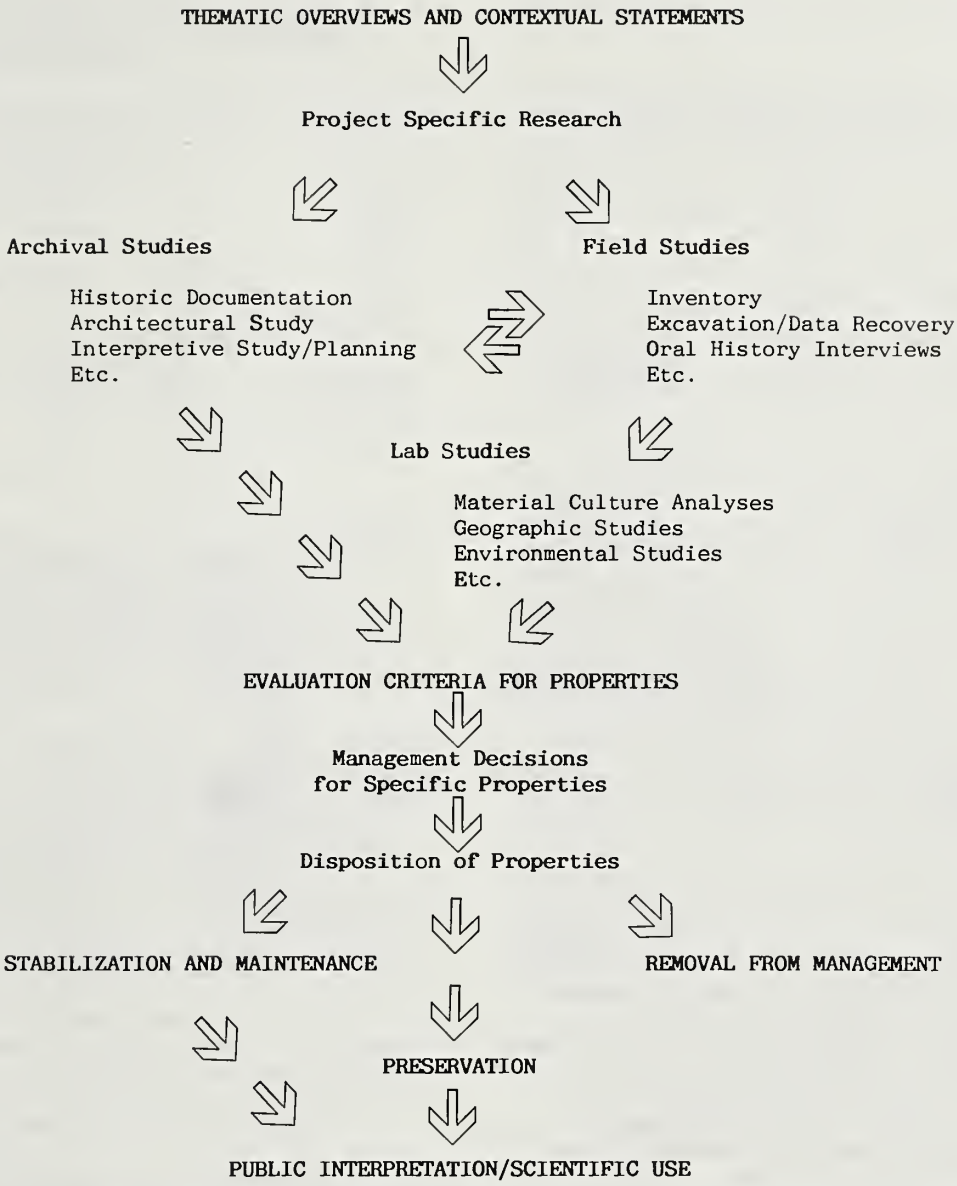

Figure 1. Research Hierarchy for Management Support Documentation

to the management of resources. This research comprises location, identification, and contextual evaluation of resources.

2. Provide a data base to the Forest Service and other agencies for use in CRM compliance procedures and accountability systems.

3. Provide a synthesis of research findings which will allow interpretation of the resources to the Service and the public.

4. Disseminate research results to the Service, the public, and the academic community.

HISTORIC RESEARCH TOPICS

It is assumed that the model for the Research Work Unit covers the Greater Southwest, and that the historical periods included for the historic sub-unit are: the Spanish Colonial Period, 1500-1821; the Mexican National Period, 1821-1848; the Anglo-American Period of Westward Expansion, 1800-1890; and the Modern Southwest, 1890 to the present. It is understood that Native American populations are of interest, and that other national and ethnic groups are included insofar as they pertain to the historical periods under investigation.

Research topics covering episodes, events and processes in Southwestern history are subsumed under the major institutions of culture: economics, religion, and sociopolitical organizations.

Three general themes are proposed to

Table 1.--Research structure and decision-making in context: example 1, research, analysis, and management of a skid shack railroad logging camp in California.

Responsibility	Activity/Product	Study Topic/Decision	Example
		Forest Economics	
Research Station	Overview	Logging	
	Overview/ Monograph	Railroad Logging	
	Topical History	Specific Area/Topic	A. Weed/Long Bell Railroad Camps, 1896-1956
Research Station		Site identified	Logging Camp: 1910
	Site Record	Site Inventory	RR grade and can scatter
or			
	Analysis	Data Collection	Artifact Collection
Forest	Documentation	Evaluation w/SHPO	Data recovered
Forest	Site info. retained only in database and repository	Management restrictions on site removed	

Table 2.--Research structure and decision-making in context: example 2, research, analysis, and management of Forest Service administrative structures built by the Civilian Conservation Corps.

Responsibility	Activity/Product	Study Topic/Decision	Example
		Forest Service Administration	
Research Station	Overview	CCC (National)	
	Overview/ Monograph	CCC (Forest)	
	Topical History	Specific Area/Topic	Ashdale Ranger Station, Tonto NF
		Structure identified	Barn, built 1935
Research Station	Architectural Record	Site Inventory	Reversible alterations
	Evaluation Criteria	Preservation/ Interpretation	
or	National Register Nomination	Evaluation w/SHPO	
Forest	Stabilization/ Restoration/ Interpretive Plan	Evaluation w/SHPO	
	Stabilization/ Restoration		
Forest	Maintenance Plan	Adaptive reuse and/or public interpretation	

organize the RWU's research. These are: ECONOMICS: mining, ranching, homesteading, logging, hunting, trapping, fishing, gathering, trade/commerce, tourism/recreation, transportation, manufacturing. RELIGION: European and Native American practices; and, POLITICAL AND SOCIAL ORGANIZATIONS: Forest Service administration, watershed management, military operations, community development, law enforcement, and ethnic relations.

METHODS AND TECHNIQUES

The full battery of methods and techniques available to historians, architects, and archeologists would be employed. These would include at a minimum: archival research, oral history, inventory survey, excavation, chronological study, architectural analysis, and data base/information management.

Analysis would be strongly oriented toward the following:

1. Studies of material culture as indicators of function, time, technology, and social context.

2. Studies of the cultural landscape as both determinant and end product of human settlement.

3. Studies of human interaction with the environment, following the precepts of cultural ecology, and using techniques such as ethnobotany.

4. Studies of human interactions with one another, especially as they involve intrusion of people into the territories of others.

ESTIMATED STAFFING AND FUNDING REQUIREMENTS

The objectives of the plan could be met through the establishment of a Unit for Historical Research, located within the National Forest Southwest Region. The Historic RWU would involve an overall staff as follows, including a combination of key core positions marked with an asterisk (*), and shared service positions from existing programs and from partnerships with other Federal agencies (e.g., BLM and NPS). Project-specific positions would be brought in under a cooperative agreement and/or contract services.

Project Leader
Secretary
Clerk Typists (2)
Historian *
Ethnohistorian *
Historical Archeologist *
Curator
Archivist/Librarian
Interpretation Specialist
Conservator
Writer/Editor

The normal amount of floor space and equipment would be required. Annual budget projections are as follows:

Personnel compensation and benefits	$532,000
Travel and transportation of persons	50,000
Transportation of things	1,500
Supplies and materials	40,000
Contract services	200,000
Overhead (rent, utilities, etc.)	300,000
Total:	$1,123,500

Forest Service personnel may wish to examine this plan and develop a phasing proposal for implementation. Our recommendation for initial funding would target the filling of key core positions within the existing Experimental Station framework. The plan recommends a three-year phasing period.

As the RWU is developed a priority research program for the Southwest Region and Rocky Mountain Station Service Area should be initiated to provide contextual criteria for the evaluation and interpretation of historic sites through topical overviews and inventories to be produced cooperatively between National Forest Service Units and the Rocky Mountain Station, with the Station focused primarily on the production of overviews.

Recommended priorities for the suggested topics are:

1. SPANISH COLONIAL HISTORY FOR THE 1992 CHRISTOPHER COLUMBUS QUINCENTENNARY OBSERVANCE. Justification: the Columbus Quincentennial commemorating the 500th year anniversary of the encounter between Indian America and Europe offers the Forest Service a national and international opportunity to justify historical overviews, inventories, and surveys of Spanish Colonial sites on Forest lands. Additional opportunities for CRM and interpretation activities should include pending bills in Congress related to the Coronado Trail Study Bill and the Spanish Colonial Settlement Commemorative Bill, which may include historical sites on Forest Service lands.

2. LATE NINETEENTH AND EARLY TWENTIETH CENTURY NATIVE AMERICAN USE OF FOREST LANDS. Justification: legislative mandates such as the American Indian Religious Freedom Act, and recent Native American interest in asserting rights to traditional land use, require that Federal land management agencies be knowledgeable about the uses that have persisted in actuality as well as tradition among Native American peoples so as to be able to deal equitably with them.

3. FOREST SERVICE BUILT ENVIRONMENTS. Justification: facilitate better management, maintenance, and interpretation of Forest Service facilities. A historical overview is recommended.

4. MINING. Justification: facilitate project-specific compliance and management of this important historic resource. An historical overview and inventory are recommended.

Toward a More Rational Management of Cultural Resources[1]

Linda Marie Lux[2]

Abstract.--The USDA Forest Service needs a process for deciding which historic properties to preserve and manage, a logical system of decision-making based on scientific principles of management, and using simple, efficient procedures. Two methods--comprehensive planning and research design--have been proposed, and are being used in the Pacific Southwest Region of the Forest Service in California. A Forest Service research program for cultural resources could help refine these two methods.

INTRODUCTION

In the USDA Forest Service, cultural resource management protects historic properties from damage or destruction by traditional activities on the National Forests. The agency annually conducts nearly 6,500 individual surveys, examines 1.5 million acres, and identifies more than 8,000 new cultural properties. To date, 18 million acres of National Forest land have been surveyed and 125,000 cultural properties have been located, mapped, and recorded. This number of recorded properties, then, has been increasing at a rate of more than 8,000 per year.

Historic preservation is a tripartite process--identification, evaluation, and management. Overall, the Forest Service has done an admirable job of identifying historic resources, but we have only begun to move beyond this first step. Only 15 percent of all inventoried sites have been evaluated to determine their historic importance or potential to yield research data. Until we can evaluate sites, how can we decide what to manage and protect?

The National Register criteria provide some guidance for evaluating significance, but they cannot provide the detailed rationale that is needed (Raab and Klinger 1977). When evaluation does take place, it is often done on a case-by-case basis without the benefit of knowing the resource's relative importance in the larger picture. Determinations of significance are based on experience and observation, empirical thinking, but not a comprehensive, rational plan. Evaluation has been almost negligible, and most properties are simply saved, categorically, with little opportunity for considering the full range of management alternatives. Important cultural resources may even escape recognition and protection.

Historic preservation laws require that cultural resource surveys be conducted in preparation for all other land management activities. Forest Service cultural resources programs have tended to focus on this compliance aspect of our responsibilities. This means that surveys are conducted in a piecemeal fashion rather than as part of planned regional programs with direction and logic of their own. As a result, within the agency, cultural resource management is often seen simply as responding to laws and regulations. The professional and scientific community perceives the Forest Service as collectors of masses of unsynthesized information. Caught up in the race to keep ahead of the bulldozers and timber sales, we seldom have time to reflect on more effective, efficient ways of managing cultural resources.

We can no longer afford to defer the process of evaluation. We cannot continue to accumulate site records at a rate of 8,000 per year without effective means of managing and protecting them. The Forest Service needs a process for deciding what historic resources to preserve, a logical system of decision-making that is based on scientific principles that uses simple, efficient procedures. We need to design a more rational approach to cultural resources management. Then, and only then, will the program become fully integrated into the land management process, and at the same time fulfill its potential to contribute to research. There are solutions and those solutions have been evolving for some time now.

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[1] Paper presented at the symposium: Tools to manage the past: Research priorities for cultural resources management in the Southwest. [Grand Canyon, AZ, May 1-6, 1988].

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This paper reviews two methods that have been proposed for rationalizing the process of gathering data and making historic preservation decisions, and describes how comprehensive planning and research design are being used in the Pacific Southwest Region of the Forest Service in California. It then discusses ways in which a Forest Service research program for cultural resources might improve and refine these methods.

COMPREHENSIVE PLANNING

In 1980, the Heritage Conservation and Recreation Service published the controversial Resource Protection Planning Process (RP3). RP3 was an attempt to rationalize historic preservation and streamline historic preservation programs while satisfying research data needs (Aten 1982). Its stated purpose was:

> To develop a comprehensive historic resource management process which identifies and organizes information about a State's historic, archeological, architectural, and cultural resources into a form and process readily usable for producing high reliability decisions, recommendations, and/or advice about the identification, evaluation, and protection of these resources (Heritage Conservation and Recreation Service 1980).

RP3 had three components: study units, operating plans, and management units. A study unit consisted of a group of historic resources defined by three common elements: theme, time, and space. An operating plan transformed the technical data from the inventory and evaluation of these study units into a program for managing the resources. Finally, management units formed the link between historic preservation and the agency's broader mission and goals.

Early in its development, RP3 met with resistance on the state planning level, and after a series of political failures and miscalculations it lost some of its momentum (Scarpino 1988). The greatest weakness of RP3, however, can be attributed to the way in which it was applied. Emphasis was placed on study units, while operating plans and management units were poorly developed. The study units provided a framework for data collection, but by themselves, lack integration of this information into the agency's planning process. Historic preservation has, therefore, remained isolated, outside the larger process (Tamez 1988).

Nevertheless, when all components of this process are fully developed, the method may provide a solution to many of our problems. Over the last decade, RP3 has been refined, and it is now emerging as the standard for historic preservation planning. The Secretary of the Interior's guidelines for Federal responsibilities, under Section 110 of the National Historic Preservation Act, describes a comprehensive planning process that is basically identical to RP3 (National Park Service 1986). In this model, historic preservation begins with the establishment of historic contexts (essentially the RP3 study units and operating plans). These contexts include the development of preservation goals and management priorities.

In a fully-developed form, historic contexts include:

- A rationale based on theme, time, and place
- Descriptions of known and expected resource types
- Their known and expected distribution
- Evaluation criteria
- Research and documentation needs
- Operating plans describing survey strategies, and management alternatives

These elements are then linked to a management plan which incorporates historic resource planning into the agency's property management, land-use planning, and project planning.

The contextual history drives every aspect of historic preservation: surveys, evaluation, management, even nominations to the National Register. This comprehensive planning process is reflected in the new multiple property form for National Register nominations, which is now a planning document in itself. In the new multiple property form, an historic theme is described and placed in both time and space. Property types are also defined. For each of these property types, a basic description, statement of significance, and registration requirements are included. Later, individual buildings, sites, and districts are nominated under this historic context. The process forces us to view historic properties as parts of larger systems and allows for comparison, rather than focusing solely on the inherent characteristics of isolated resources to determine their value.

REGIONAL RESEARCH DESIGNS

Research design is the second method that has been developed as a means of clarifying theoretical goals and defining ways in which these goals can be realistically achieved. A research design:

- Defines the universe of study
- Provides a rationale for the intended work
- Identifies important questions and problems to be investigated

- Describes the methods to be used for data recovery and analysis
- Shows how the methods relate to stated aims and help to determine significance
- Sets forth realistic expectations for the research
- Provides a mechanism for disseminating the results of research to the public

By the 1970's, it had become clear that we needed a way to deal with the growing conflict between salvage archaeology and long-range research programs (Goodyear 1978, King 1971, Schiffer and Gumerman 1977, and others). More and more, surveys were being conducted to mitigate land disturbing activities, yet, early on it was argued that it was possible to develop large-scale, long-range regional research programs so that these projects could contribute to research designs (King 1971). These earlier discussions focused on research designs for prehistoric archaeology, but clearly a similar perspective was needed for historic resources. Today, cultural resource management continues to be driven by other priorities, and the need for research designs is perhaps even greater.

As contrasted with more intuitive approaches, research designs lead to efficient, cost-effective work because they maximize the yield of relevant information (Moratto 1981). They also permit the evaluation of research findings in terms of explicit criteria (Brown and Elling 1981; Goodyear 1978; Shiffer and Gumerman 1977). The formulation of major research questions and the construction of alternative hypotheses can provide a new focus for cultural resource programs and ensure that they contribute to the discipline.

MERGING HISTORIC PRESERVATION AND RESEARCH DESIGN

To remedy the difficulties inherent in the management of cultural resources on a case-by-case basis, the Pacific Southwest Region of the Forest Service is developing a series of regional, thematic comprehensive plans. By presenting a regional perspective, we are emphasizing research problems common to a broad, geographical area. A cultural theme focuses on a particular type of historic activity, land-use, or property type.

In 1986, the Forest Service joined with the Califonria State Historic Preservation Office and other Federal agencies to identify resource types to be developed in the initial effort. We sought property types frequently encountered throughout the region, that shared a common theme and physical characteristics. The property types we chose can be evaluated and managed using standardized guidelines. Pioneer studies such as the Forest Service plan for Civilian Conservation Corps buildings in the Pacific Northwest Region (U.S. Department of Agriculture 1983) and the California Department of Transportation's study of truss bridges (1983) were used as models.

The Forest Service chose to develop comprehensive thematic plans for the following types of properties: railroad logging sites (U.S. Department of Agriculture 1987a), fire lookouts (U.S. Department of Agriculture 1987b), Forest Service administrative buildings (U.S. Department of Agriculture 1988a), western mining sites, and recreation residences (U.S. Department of Agriculture 1988b). We are also participating in interagency teams to develop thematic plans for isolated bedrock mortars, sparse lithic scatters (Jackson 1988), and tin can deposits (U.S. Department of Agriculture 1988c). Clearly, the approach can be used to organize a wide range of property types, both historic and prehistoric.

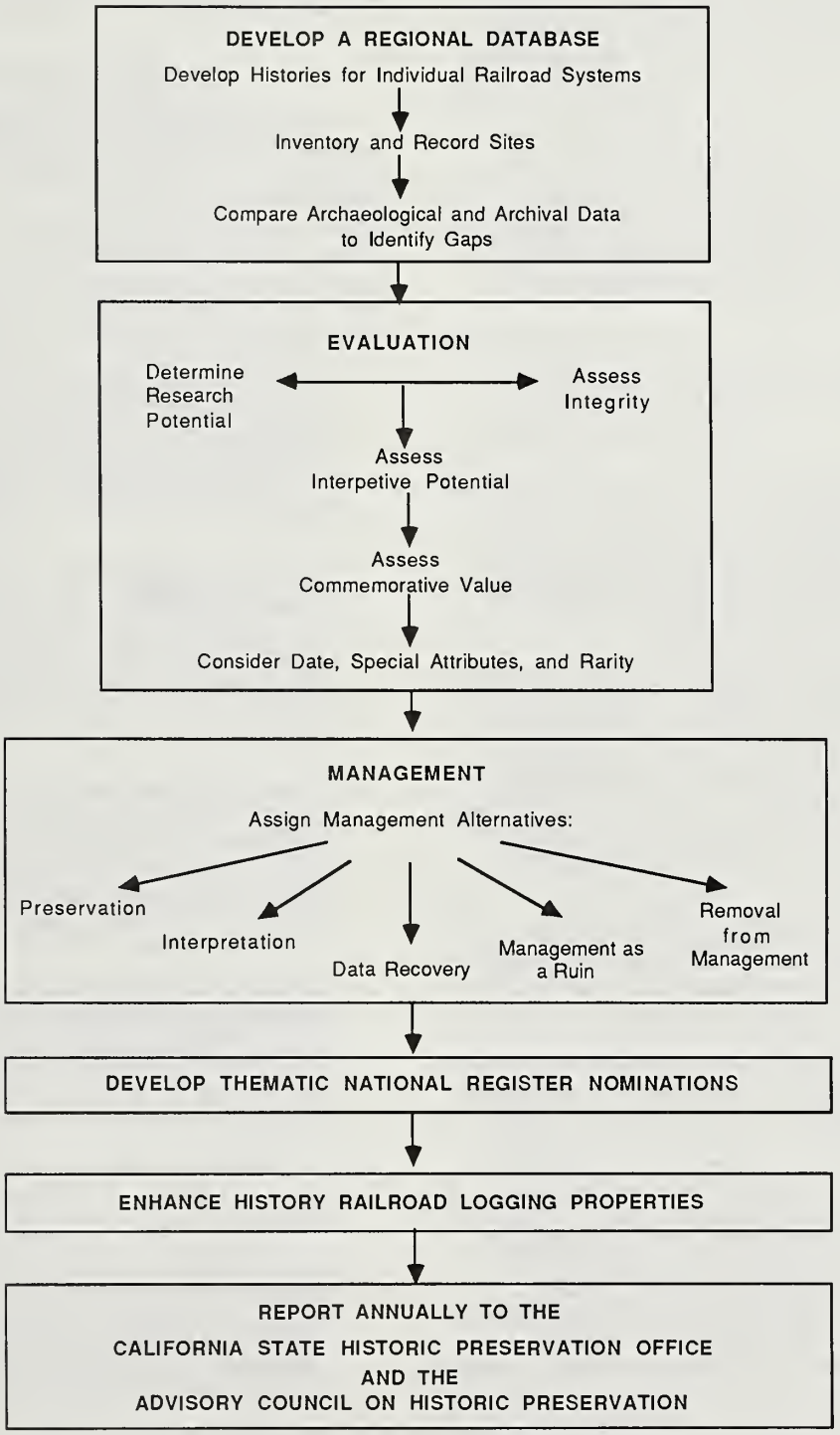
The plan for railroad logging sites merges the two methods, comprehensive planning and research design, to satisfy both historic preservation and research needs. An outline of this plan will demonstrate how these methods are integrated. The three elements of the study are its cultural concept--historic railroad logging systems, its chronological limits--1860 to 1940, and its geographic limits--California's National Forests; theme, time, and place.

The plan consists of three interrelated parts: a regionwide contextual history, a management plan, and a research design. The contextual history provides an overview of railroad logging in the State and, by defining the importance of this theme in California history, provides a rationale for the study. The management plan describes the process for gathering and synthesizing pertinent data, provides evaluation criteria, and describes a process for choosing management options for these resources. The research design poses regional research questions in four broad areas: economics, technology, environment, and sociocultural dynamics. The three documents are thoroughly interrelated so that evaluation and management are justified by the regional history and driven by the perceived needs generated in the research design.

The management plan is an important element and moves the process from simple data collection to evaluation and management decisions. The first phase of the management plan is to develop a regional data base. Under the larger regional history, more specific histories are compiled that provide descriptions of individual logging railroad systems. Within each system, all known, recorded sites are identified. The archaeological data are then compared with the contextual histories and archive records to identify problems, such as gaps in the information.

In the second phase, the data base is used in conjunction with the research design to evaluate the significance of a site. Properties are assessed for their potential to answer the

PACIFIC SOUTHWEST REGION'S RAILROAD LOGGING COMPREHENSIVE PLAN



regional research questions outlined in the research design, and to fill the identified gaps in the historical record. The integrity, interpretive potential, and regional and local commemorative values of the property are also assessed. Factors such as date of construction, special attributes, and rarity are considered to ensure that a temporal cross section of railroad logging sites is preserved as well as properties that are unique. To some extent, these criteria relate to National Register criteria; however, the emphasis here is on choosing management alternatives.

In evaluating railroad logging properties as a thematic group, their regional significance becomes more apparent, and a choice of appropriate management alternatives is facilitated. Five alternatives are defined in the management plan:

- Preservation
- Interpretation
- Data recovery
- Management as a ruin
- Removal from management consideration

The goal in chosing among these is to ensure that a representative group of railroad grades, associated sites, and features are preserved--sites that possess integrity, are historically significant, and/or have potential to yield important research data.

Finally, the Forest Service will actively engage in enhancement activities. The contextual history and research design facilitate a multiple property National Register nomination. Railroad logging properties can be nominated based on regional criteria and documented as to their importance within California's history. The Forest Service will encourage historical and archaeological research in areas where high risk to railroad logging properties exists, but as part of broader, regional historic preservation objectives. These sites will be considered equally with other resources on the Forests; and their management will be integrated into the other functions of the agency.

Although it might be desirable to implement the plan simultaneously throughout the Pacific Southwest Region, that is not practical. Instead, the plan will be developed on a Forest-by-Forest basis, throughout the Region's 18 National Forests, over the next several years. The comprehensive plan is a dynamic, changing document that will be updated periodically to reflect advances in theory, method, and knowledge, as the data base develops.

Because of their complexity, railroad logging sites pose a unique challenge in comprehensive cultural resource planning, and should prove a formidable test of this approach. Here, we are not addressing discrete property types such as bridges or administrative buildings but, rather, a complex, production-oriented system. Yet, as with the more easily-defined property types, we can treat these complex systems in a consistent manner. The comprehensive plan provides standards and guidelines for this process.

REFINEMENT OF THE PROCESS

Application of the comprehensive planning approach is still in its early stages, and as the contextual histories and research designs are implemented in the field, the need for refinement of the process will undoubtedly arise. At this point, there are several areas where more knowledge would increase the effectiveness of the process and where Forest Service research might contribute to this effort. We need:

- Criteria to determine what data capture a property's essential character and its relation to its environment, to ensure that cultural resources contribute to the solution of research problems. A base level of scientific observation needs to be defined.
- Methods to determine historical significance that reduce bias. Criteria for evaluation often seem subjective to those unfamiliar with the goals of historic preservation. One approach would be to ask a group of resource specialists to rate a thematic group of sites, compare results, and identify the areas in which ratings are most consistent.
- A system for classifying research problems and developing regional research designs that are comprehensive enough to evaluate the significance of any site within a given region. Our knowledge is still limited in some areas of study, and research problems are not always clearly defined.
- Criteria for determining what constitutes a representative sample that will meet future needs. A comprehensive approach is dependent on current technical, methodological, and theoretical knowledge, therefore, it is important to preserve representative samples.
- Automated data base systems to assist with data collection, track evaluation and management decisions, and facilitate research.
- More effective methods of integrating historic preservation goals into the larger planning process. Managerial and technical options need to be presented in a form that can be understood, accepted, and applied by others in the organization.
- A process to quantify rates of resource loss and determine how to compensate for this in comprehensive planning; a means to measure the

adequacy or inadequacy of present protection systems.

- Refinement of the comprehensive planning process so that it addresses questions about "how" and "why" cultural systems vary through time and space. A process for relating the various themes may, in part, accomplish this objective.

- Methods for evaluating resource interpretation, and for ensuring that a diversity of people are identified in our interpretation of the past.

BENEFITS TO THE RESOURCE

This broad, regional approach has several advantages. Most important are the benefits to the resource. We simply cannot do justice to these historic properties until we can evaluate them in a comprehensive framework. An isolated artifact has little or no research value when taken out of context. Similarly, an isolated railroad grade or logging camp has limited potential to yield information when taken out of its historical context.

This approach will also enable National Forest Archaeologists to advance beyond the inventory process, to evaluate and manage historic sites. Comprehensive planning will provide these resource managers with the criteria needed to make important decisions, such as which sites to preserve.

A third benefit will be savings in time and dollars. The present system of evaluating properties is time consuming, and can even result in the unnecessary loss of the resource before research information has been documented, or the potential for interpretation or commemoration assessed.

Comprehensive planning has great potential. Management of the resource with larger, regional concerns in mind will ensure that research and data needs are met, and that these resources will be accessible for future study and for public appreciation.

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Planning for Obsolescence in Integrated Research[1]

Joseph A. Tainter[2]

Abstract.--Forest Managers should undertake integrated cultural resources research with a prior understanding of what such a program can accomplish, and what it cannot. This paper addresses limitations in integrated research designs, and recommends ways to accommodate these limitations.

INTRODUCTION

One of the challenges of representing a scientific discipline in a land-managing agency is explaining technical matters to line and staff officers. No doubt all specialists share this problem, for there is a mystique about science which can be difficult to overcome. The public thinks of science as dealing in concrete facts, as a definitive, rational endeavor, and as producing cumulative findings. There is an implicit assumption that if society invests long enough in science, some day the universe will be fully understood, the scientists can be pensioned off, and the results turned into useful products. Those who practice science often suspect the opposite: that facts are relative to perception, that scientific truth is a political consensus, and that scientific change is as likely to be revolutionary as cumulative. Long before the universe is fully understood we will reach the point where we cannot afford to learn much more.

A program of scientific research in a land-managing agency will have both benefits and pitfalls. Perhaps the greatest pitfall is in the expectations of non-specialists about the nature of such a program and what it can produce. Those who manage parcels of National Forest will expect concrete results from our research. These managers, in my experience, often view archeology with the same misconceptions that guide public perceptions of science overall. These misconceptions may be too ingrained ever to correct, but the matter at hand is too important not to make the attempt. A cultural resources research program would benefit forest management, but we should estimate beforehand what those benefits might be, as well as what they cannot be.

My topic is integrated research designs, but the comments I will make are pertinent to all aspects of planning a research program.[3] My points are:

1. The importance of an archeological or historical site is neither intrinsic nor permanent.

2. Contrary to its public image, science is not exclusively a rational, cumulative process.

These first two points, as I will explain, limit how an integrated research design can be used for on-the-ground management.

3. There is a tendency toward inertia in both government and science. In planning a research program we must recognize that this is inevitable, and consider how it affects the dynamic nature of research.

4. Scientific research reaches a point of diminishing returns. Research is an economic investment: it has costs and yields benefits, and the benefit/cost ratio is not static.

The discussion of these points will be clearer if I begin by outlining the nature of integrated research designs.

INTEGRATED RESEARCH DESIGNS

As used in cultural resource management, a research design specifies what is known about the past occupation of a region, and what important things remain to be learned. The assumption is that the value of an archeological or historical site cannot be determined in isolation. That value can only be found in the relationship of a site to other sites, and to an overall body of knowledge.

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[3] For more detailed discussions of these points see Dunnell (1984), Tainter (1988: 99-106, n.d.) and Tainter and Lucas (1983).

Those who support a research-based approach to management argue that research designs can accomplish several things. These include: (a) providing a basis for assessing individual sites; (b) ensuring agreement about preservation goals and fieldwork standards; (c) requiring that substandard work be improved; (d) establishing excavation priorities among threatened sites; (e) providing objective decision-making criteria that can be used to resist political pressures; and (f) developing understanding and support among non-specialists (e.g., T. King 1971, 1977; McMillan et al. 1977; Nickens 1980; Raab and Klinger 1977; Wendorf 1980; L. King 1980; Comptroller General 1981). To the extent that any site may yield information pertinent to the research design, decisions can be made about preservation or study, methods of accomplishing these can be specified, and support can be developed in the public arena.

Yet integrated research designs that are thoughtlessly developed or applied will bring more harm than benefits. Thus it is necessary beforehand to discuss research designs within the context of the four points I have raised.

THE IMPORTANCE OF SITES

From its very earliest years the historic preservation movement in this country faced an embarrassment of riches. There were far more worthy properties than there were time or money to save them, and ways had to be found to determine which merited attention (Hosmer 1965). Preservationists have dealt with this concern for at least a century now, and at least one lesson is clear: if there was an easy answer to the problem of rating the importance of sites we surely would have found it by this point.

Many professionals believe that the research design can solve this problem, at least for archeological properties. As a research design specifies what important things are to be learned about history or prehistory, it will also specify what kinds of data are necessary to learn these things. An archeological site can then be evaluated by whether it is likely to yield information pertinent to the research design.

Many archeologists have found this argument disarmingly attractive. It is simple and clear, and seems to provide an easy answer to a convoluted problem. A peek under the surface, however, reveals that it solves current management problems by short-changing the future. As an approach to managing immediate impacts (e.g., strip mining) the research design is commendable. An an approach to long-term management, however, it has crippling defects.

The problem is that the federal regulations (36 CFR 60.4), and many managers, assume that the importance of a site is intrinsic and permanent (Tainter and Lucas 1983: 710-711). We know, however, that scientific disciplines change, often quite radically (Kuhn 1970; Willey and Sabloff 1974; Dunnell 1984). As any science changes it asks new questions that require new kinds of data. If archeological sites are rated by how they may contribute to solving research questions, then clearly that rating cannot be permanent. As states of knowledge and theories inevitably change, in archeology as in any science, the importance of individual sites will change also. Significance is not inherent or immutable. It is not a part of the cultural property, but is in the eye of the beholder. A site is never permanently significant or insignificant to science (Tainter and Lucas 1983: 714-715).

THE POLITICS OF SCIENCE

My second point is that science is not exclusively a rational, cumulative process. Decisions are made in science, as in any human endeavor, in a matrix of social relations and political maneuvering.

Until the mid to latter part of the nineteenth century science was generally the province of the gentleman-amateur, who was typically a wealthy dilettante pursuing individual studies in natural science. The image that emerged at this time - the lone-wolf natural scientist - is a powerful one, and perseveres to this day in our national mythology. It is strongly reflected in media presentations, where scientific findings are depicted as the accomplishments of heroic individuals who grapple with a recalcitrant universe that yields its secrets to ingenuity and persistence. Science, in this myth, progresses by the efforts of many thousands of Sherlock Holmeses, each pushing back the frontiers of knowledge by doing things like slashing through Amazonian jungles or peering long hours through lonely telescopes.

However romantic this vision, it has not been accurate for some time. Long ago, growth in the size and complexity of science required the development of learned societies, research institutions, and interdisciplinary teams (Price 1963). Science today is so institutionally organized that it is the subject of an entire subdiscipline of sociology (e.g., Merton 1973; Blume 1974). As social scientists we should not be surprised by the findings of this school, although they are something that we don't consider often enough. The sociologists remind us that science today is a social and political process. A scientist rarely practices alone anymore. He or she is usually part of a community of scholars, and is subject to all of the pressures and influences that operate in any human community. As in any social unit, the members of a scientific community are linked by common experiences in education, apprenticeship, ethical standards, shared goals, communication, and agreement in many matters of professional judgment (Kuhn 1970: 177-178, 1977: 296; Dunnell 1984: 63).

Although we commonly think of scientific findings as emerging from the rational application of scientific methods, a sociologist of science would reach a different conclusion. That which passes as scientific knowledge, in the sociological view, is a political consensus: "...empirical truth," asserts one sociologist, "is affirmed through agreement" (Blissett 1972: 94).

A scientific observation becomes enshrined as a textbook principle through a political process. This is admittedly not a frequently-heard assertion, but it is easy to show that science must be so. To begin with, no scientific finding is of any value unless it is socially recognized - and this means that it is affirmed by the scientific community. Secondly, in the absence of a social consensus all facts are equally important. The consensus principle reduces the chaos that would exist if every idea was welcomed equally. And thirdly, a scientific consensus focuses inquiry, directing attention to some small aspect of nature that could not otherwise be studied in such detail. There is no way without a consensus to focus research (Kuhn 1970: 24; Barnes 1982: 7; Blissett 1972: 95-97, 100, 102; Ziman 1968: 18, 55).

A scientific discipline, like any social system, can maintain itself only with mechanisms that select for and perpetuate its consensus. These range from subtle selection and training to peer pressure to outright political manipulation. Experienced scientists know that to make their contributions acceptable they must maximize the agreement that they can reach with their peers.

Developing integrated research designs is a process of engineered consensus in which the political element will be manifest (Tainter n.d.). The research designs that emerge will be ones that have survived multiple political trials. They must have broad professional support; they must seem worthwhile to a majority of a region's archeologists; and they must appear more important than a host of competing ideas. While scientific rationality will certainly be important in designing integrated research, it will not be the only factor, or even the dominant one. Integrated research designs will be primarily the product of negotiation and political consensus. This in itself is not a matter for concern, except insofar as we use short-term political considerations to make long-term preservation decisions.

The two points discussed so far - that importance is an assigned quality and that designing joint research is a political process - limit what we can expect to accomplish with integrated research designs. The importance or significance of a site is not inherent, but is assigned in the context of consensual science. Significance can never be immutable, for neither are scientific frameworks. As a temporary political arrangement, a scientific consensus will be a poor basis for what will often be irrevocable preservation decisions.

Integrated research designs are a marvelous idea, and they have the potential to accomplish much. They will allow agencies to implement a common approach to such areas as research, public interpretation, stabilization, and mitigation. The one thing that they will not do is give us guidance for deciding which sites to preserve and which not to. Research designs emerge from scientific frameworks, and we know that today's scientific frameworks will change. We also know that today's scientific consensus is based on short-term political considerations. It seems unavoidable to conclude that preservation decisions cannot emerge from an integrated research design.

INERTIA

Both government and science (McCain and Segal 1973: 150) are characterized by a level of inertia that is not propitious for integrated research designs. Government pronouncements today may no longer be written in stone or on clay tablets, but they seem often to achieve a similar longevity. One of the main pitfalls of government-sponsored research designs is the possibility that, once formulated, research designs may be very hard to change.

It is possible that integrated research designs will fail utterly to respond to the dynamic nature of science. The main potential for a problem lies with non-specialist managers, who must struggle with many competing demands and find the scarce funds to support cultural resource management. These persons often know little about science beyond the popular myth that it is rational and cumulative. The tendency of managers will be to think that once they have funded integrated research designs the job will be done, and they need not plan for future spending in this area. Our challenge is to explain that scientific disciplines change constantly, that change is often revolutionary, and that developing integrated research designs is a task that will never end. Many managers, in my experience, will not like to hear this message.

The second concern under the heading of "inertia" has to do with economics. The experience of agencies that fund basic research is that it is less expensive to continue an established line of research than to start a new line (Blissett 1972: 98). We should not expect that the economics of research in the Forest Service are any different. Once research suggested by an integrated design is under way it will tend to foreclose other lines of study. There is no easy answer to this problem, and I raise it only to point out that several factors may converge to produce the same undesirable outcome: integrated research designs that cannot keep abreast of current developments.

ECONOMICS OF RESEARCH

The final consideration I wish to raise has also to do with economics. It is generally unrecognized, but nonetheless true, that scientific studies tend to reach a point of diminishing returns. This is, of course, characteristic of economic investments in general. In science, diminishing returns set in when higher costs - for such things as laboratories, equipment, or salaries - are not matched by proportionate returns in knowledge (Rostow 1980: 171; Rescher 1978, 1980; Tainter 1988: 99-106). The marginal return to the investment declines as a unit increase in expenditures yields less than a unit increase in knowledge. One implication is that exponential growth in the funding of research becomes necessary simply to maintain a constant rate of progress (Rescher 1980: 2).

There are anecdotal incidents from archeology to illustrate this tendency (e.g., T. King 1981), but there are better, quantitative illustrations from other fields. Medical research and application provide a good example of diminishing returns in a scientific field. Ever greater investments in health care do not yield proportionate increases in life expectancy. In 1930 the United States allocated 3.3 percent of its gross national product to produce an average life expectancy of about 60 years. By 1982, 10.5 percent of GNP was being invested to produce a life expectancy of about 75 years. The pattern in the intervening decades is shown in figure 1. It can be seen that from 1930 to 1982 the productivity of the U.S. national health care system declined by over 57 percent (Tainter 1988: 102-103).

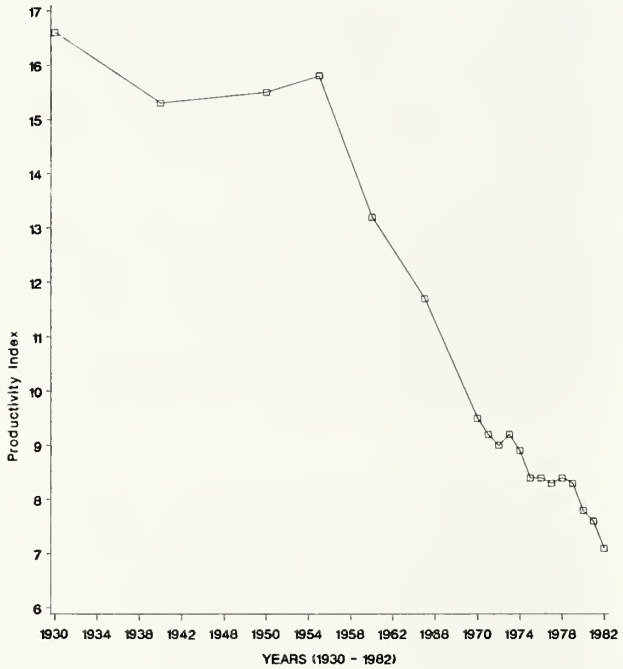

Figure 1.--Productivity of the U.S. health care system, 1930-82 (after Tainter [1988: 103]; data from Worthington [1975: 5] and U.S. Bureau of the Census [1983: 73, 102]). Productivity Index = (life expectancy)/(national health expenditures as percent of GNP).

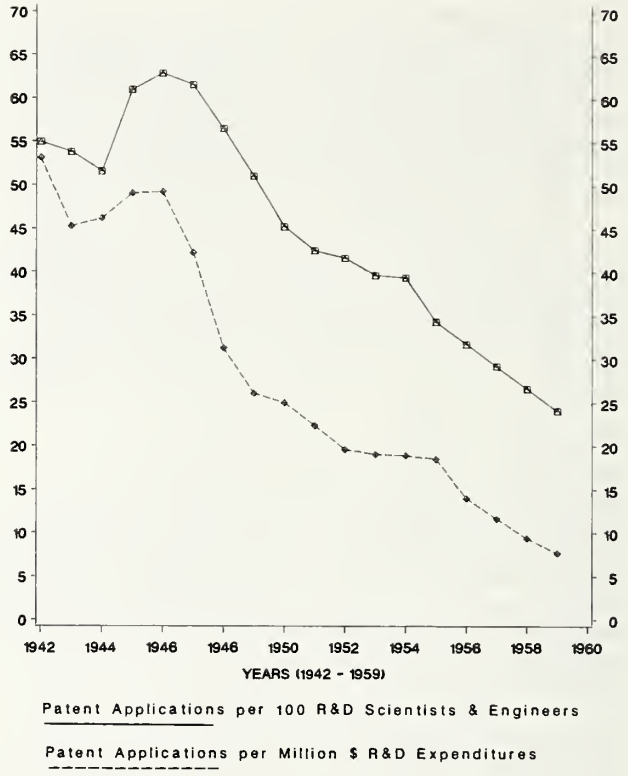

Figure 2.--Patent applications in respect to research inputs, 1942-59 (after Tainter [1988: 101]; data from Machlup [1962: 173]).

One philosopher who has studied this matter is Nicholas Rescher (1978, 1980). He suggests that

> Once all of the findings at a given state-of-the-art level of investigative technology have been realized, one must move to a more expensive level.... In natural science we are involved in a technological arms race: with every "victory over nature" the difficulty of achieving the breakthroughs which lie ahead is increased (Rescher 1980: 94, 97).

This problem is not restricted to individual disciplines; it pervades science as a whole. Figure 2 shows that as the resources committed to scientific research have grown in recent years, the productivity of these resources for producing patentable inventions has declined noticeably.

Diminishing returns to research are normal, and mark a discipline that has reached a level of

intellectual sophistication where it can ask questions that are difficult and costly to answer. One would not want to advocate undertaking only studies with a high ratio of findings to costs. In archeology this would limit us to asking primarily factual questions on the level of What, When, and Where. Yet any science that relies on public funding exposes itself to misunderstanding when it undertakes costly research that has an uncertain return.

Once again we are brought back to the conflict between managers, who ordinarily are not experienced in subtle economic trends, and specialists, who must justify constant requests for greater funding. This conflict is clearly evident in archeological survey. Managers try constantly to restrain the cost of finding sites, and typically ask why it is not sufficient to find most of the sites in an area. Some archeologists, in contrast, argue for the opposite: that we need to locate not only every site, but every isolated artifact.[4] The latter approach would be a classic case of diminishing returns: very high costs, quite uncertain results, and a benefit/cost ratio that few managers could accept.[5]

Integrated research, and all aspects of the program under consideration, will reach the point of diminishing returns. At this point those who control the purse will be tempted to phase out the program, reduce its scope, or change its focus. The problem will be that this is the point where our research will have passed its initial phases, and is finally starting to investigate topics of genuine merit. It is important to remember that in an environment of diminishing returns, the difference between a constant budget and a declining one is only a matter of degree.

SUMMARY OF CONCERNS

In summary, I believe that both specialists and managers need to recognize the following points before we proceed to develop integrated research designs.

First, a research design provides little or no basis for making irrevocable preservation decisions. Significance is not intrinsic to sites; it is assigned in the context of research frameworks. Any system of rating sites through integrated research designs will be based on short-term political considerations, not - as is often believed - exclusively on rational logic. To use an integrated research design to decide which sites to preserve is to do an injustice to our data base. Preservation decisions cannot emerge from an integrated research design.

Secondly, we must be alert to the possibility that, once in place, research designs may be very hard to change. The inertia of government and science, and the economics of funding new lines of research, will tend to cement in place whatever research topics we begin with. It is for this reason that many archeologists are reluctant to accept integrated approaches.

Finally there is the matter of diminishing returns to research. This problem may work in a direction counter to the last, for as a line of research becomes costlier and produces more infrequent breakthroughs, managers will be tempted to curtail it or shift study to other topics. This may happen just as we get to the point where we are finally able to ask interesting questions.

RECOMMENDATIONS

This has been a pessimistic appraisal. Yet I raise these points not to be a naysayer - I fully support integrated research - but to suggest that the Forest Service approach this matter with a dose of realism. When the agency first started to take seriously its cultural resources responsibilities, most line and staff officers did not know what they were getting into. This mistake has led to much misunderstanding over the years, something I do not want to see repeated when the agency undertakes a new research mission. A judicious program of cultural resources research will benefit historic properties, multiple-use management, and the agency's public image, and integrated research designs could profitably be pursued in such a program. Yet archeologists and managers alike will be much more satisfied if we design the program to avoid the pitfalls I have described. I will conclude with some proposals for how to accomplish this.

The most important matter is for both specialists and managers to understand at the outset what integrated research designs can accomplish and what they cannot. I see the main benefits being as follows:

- focusing the work of many agencies on common scientific goals, thereby ensuring a concentrated effort in addressing research questions;

- coordinating programs of public interpretation, so as to avoid both gaps in coverage and duplication of effort, and ensuring the most effective use of resources;

- developing a common pool of background knowledge, thus maximizing the investment in professional expertise;

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[4] E.g., Camilli, Eileen L., Signa Larralde, and John Roney. n.d. Navajo-Hopi land exchange archaeological project interim report. Report on file, Bureau of Land Management, Albuquerque District Office, Albuquerque, N.M.

[5] Tainter, Joseph A. 1987. A framework for understanding the evolution of survey methods in cultural resource management. Paper presented in the symposium "Low Density Archaeological Phenomena" at the Fifth Jornada Mogollon Conference, Human Systems Research, Tularosa, N.M.

- coordinating efforts in archeological survey, so that arbitrary patterns of land ownership do not restrict our data base to the extent which is now the case; and

- providing a common approach to mitigation where site destruction is unavoidable, ensuring that mitigation studies produce coordinated rather than idiosyncratic results.

This list suggests that integrated research designs will produce enough worthwhile tasks to keep all of us happy and busy for some time. When we must decide whether or not a site merits long-term preservation, however, we cannot turn to a research design to find the answer.

Among the preservation plans that I have seen - and I have read a great many (Tainter n.d.) - the common approach seems to be that once the planning document is complete, attention can be turned to other matters. Given the many pitfalls in cultural resources planning this is a short-sighted approach. If we undertake to develop integrated research designs, it should be with the expectation that this is a process with no end. As scientific frameworks and the costs of research change, so also must the research designs that guide management. Scientific and economic change must be anticipated and provided for. An integrated research design will be worthwhile only if there is a commitment to undertake continuous development and constant revision, and to provide the funding that this will require.

The last recommendation concerns staffing. Most archeologists, both in and out of agency employment, are harried, overworked individuals who deal constantly with pressing matters. In my experience, such persons will routinely put abstract planning tasks to the bottom of their priority list, below the unavoidable demands of day-to-day business. This is a matter of necessity, whatever the archeologist's personal inclination. What this means is that we cannot simply provide good will and funding for continuously developing research designs. These by themselves will not get the job done. It will also be necessary to assign a specific person to the task, a person who has no higher responsibilities. Not the least of this person's concerns will be to explain why the research reaches diminishing returns: why costs go up and up for research that seems ever more esoteric.

Clearly, then, integrated research designs will require a significant and ongoing commitment of resources - a commitment that we must acknowledge and measure beforehand. If we cannot make this commitment at the outset then we should not undertake the task at all. If we decide that the costs of such a program are too high compared to its benefits then it would be best simply to drop altogether the idea of integrated research. A partial effort in this area may do more harm than good, and a management effort that is idiosyncratic and chaotic is to be preferred to one that is systematic but short-sighted.

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Integrated Research Designs: a Tool to Manage the Past[1]

Evan DeBloois[2], Shereen Lerner[3], Linda Lux[4], John Schelberg[5], Joseph Tainter[6], and David Wilcox[7]

INTRODUCTION

One of the problems of cultural resource management is that it is practiced by dozens of agencies and hundreds of archeologists and managers. The outcome is a bedlam of idiosyncratic programs and results. Rarely is there an opportunity to design a coordinated approach or to synthesize results. The purpose of a program of integrated research would be to deal explicitly with this problem by coordinating the cultural resource management efforts of Federal agencies and State Historic Preservation Offices. This would serve to:

- focus the work of management agencies on common scientific goals;

- coordinate programs of public interpretation;

- develop a common pool of background knowledge;

- coordinate efforts in archeological survey; and

- provide a common approach to mitigation where destruction of sites cannot be avoided.

The term "integrated research" has been chosen to indicate several things. It refers to coordination of research efforts among archeologists and across geographical areas (what is also called a regional research design). It refers as well to coordination of management and research efforts among Federal agencies and State Historic Preservation Offices.

Integrated research should be conducted under the auspices of state historic preservation planning and Forest land management planning. A program of integrated research should be designed to be a link between these planning efforts. A State Historic Preservation Plan is intended to guide historic management throughout a state, while Forest planning is intended to guide Forest multiple-use management. Both levels of planning will be improved if they proceed in a coordinated manner, and build upon each other.

This document covers a variety of topics (and indeed it includes some diverging views). It will be worthwhile at the outset to explain briefly why these matters have been addressed.

Research Designs

Research designs have a central role in archeology today, and in cultural resource management. Managers often do not realize this, and conclude erroneously that historic preservation is conducted in an intellectual vacuum. For this reason we discuss briefly the role of research designs in the discipline.

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Archeological Goals

Archeology in recent decades has gone through a period of very rapid change in goals and assumptions. These changes in the framework of the science will of course influence management priorities. It is important that non-specialist managers understand both these changes and the current goals of archeology.

Goals of State Planning

An essential matter to discuss is the nature and goals of state historic preservation planning. This level of planning, as noted, is intended to guide statewide efforts.

Examples of Planning

In some places, Federal agencies and State Historic Preservation Offices are already developing systems of the kind we have in mind. Some examples are described in the sections titled "Comprehensive Planning in California" and "The Southwest Division, Corps of Engineers, Cultural Resources Overview."

Integrating Academic and Management Archeology

In the experience of many specialists there is often a conflict between the needs of managers and the standards of scientific research. A section of the paper is devoted to discussing the needs and expectations of academic archeologists. This is a matter about which managers need to be aware.

Data Base Management

One item that emerged in the course of our discussions as highly important is data base management. Many questions of both management and research would be easier to answer if we possessed electronic data bases that contained archeological, environmental, and managerial information. Such data bases will be most applicable and cost-effective if they are developed by, and useful for, several agencies.

We conclude with a discussion of considerations in designing a program of integrated research, and with a recommendation for work to pursue first.

RESEARCH DESIGNS

One major component of archeological research conducted today, especially in the context of "contract archeology," is the use of research designs. Research designs provide a structure or basis from which avenues of inquiry may be sought. Research designs define goals and objectives, and the approaches or methodologies to be used to achieve them. One of the advantages of a research design is that it may be used as a tool to define the scope of a project. Research designs, however, must also be dynamic, to allow for refinement of research questions and enhancement of approaches as information is gathered. The integration of research designs with management archeology is critical to identifying key research issues, the data necessary to address those issues, and agency/management objectives.

ARCHEOLOGICAL GOALS

One of the more common misconceptions of agency managers is that archeology is primarily a descriptive discipline in which data are gathered ad infinitum. This misconception arises as a result of the differing assumptions, objectives, and goals held by managers and archeologists. One manager was recently heard to complain that all archeologists do is survey and record sites, plot them on maps, file the information, and then tell the manager what he or she can and cannot do in an area. This complaint clearly expresses frustration and a lack of understanding by the manager of the goals of archeology. This lack of understanding is a result of the agencies' need to focus most of their work on compliance actions, thereby preventing the archeologists from taking the data collected to the next step - beyond management needs and into research aimed at understanding human behavior. Because of the need to meet the mission of an agency, archeology in an agency is often descriptive, only venturing into interpretation when avoidance of sites is not feasible and actual data collection and analysis may occur.

Archeologists seek not only to collect data but to interpret them as well. Over the years there have been numerous changes in the goals of archeology, both of a theoretical and a methodological nature. At the data collection level, archeology has evolved from collecting primarily decorated ceramics, projectile points, and formal tools, to collecting all types of artifactual material as well as botanical and faunal remains. The recording and study of archeological sites has shifted from an emphasis on large sites with visible structures, to the point where even isolated artifacts are recorded as evidence of human activity. Although isolated finds are not usually studied beyond initial recording, small sites with surface scatters of artifacts are now routinely examined whereas just a few years ago they were typically overlooked. This new penchant to look at smaller data sets does not suggest that the large sites have been exhausted or are fully understood, and that only small ones are left to study. It suggests rather that the big sites provide only one view of a larger behavioral system. For example, to study only Phoenix without understanding Ajo or St. Johns would provide a biased view of life in Arizona, leaving out many details of the social, economic, and political systems of the state.

Archeological goals therefore have changed from the description of cultural remains to an effort to understand human behavioral systems. Not only have the types of data gathered and the types of sites recorded changed, but also the research questions that are asked. In the Southwest we seem to go in cycles, changing our focus of research every decade or so. Chronology, water-control devices (canals), sociopolitical systems, exchange, and community patterns are all issues examined in the past ten years. Some of these issues are studied on a fairly regular basis, others more sporadically. New issues such as the identification of temporary structures (field houses) in the Salt River Valley are being explored. Change in research issues does not mean a change in priorities but merely a shift in focus. This is often a result of the discovery of new information. A key factor is that while not all research questions can be answered, neither should posing such questions be limited or restricted to management needs. A compromise between management and research needs is necessary to allow for flexibility, thus permitting archeological goals to change as new information is gathered and incorporated into existing data bases.

GOALS OF STATE PLANNING

Each state is required, by law (National Historic Preservation Act, 1966, as amended), to implement a planning process that culminates in the development of a State Historic Preservation Plan. While the plans themselves are unique to each state, they are guided by a common bond and they tend to be resource-based. By necessity, the planning documents should identify the status of current knowledge of cultural resources in each state. As part of such a structure, no plan should be seen as a finalized document. The plans are dynamic and changing tools that must constantly integrate new information and research objectives.

The plans themselves, however structured, should accomplish several goals. These goals include:

1. identify data gaps;

2. identify research needs;

3. define historic and prehistoric research contexts;

4. guide research and data collection;

5. integrate different data sets;

6. identify research priorities, especially in areas under development pressures;

7. integrate with agency management plans;

8. centralize data;

9. reduce redundancy; and

10. enhance creativity of research.

These goals overlap to a great extent and in the following discussion are combined to elucidate their interrelationship.

Data Gaps/Data Collection

These terms correspond to the identification of areas in which very little archeological work has been conducted. This identification does not preclude continuing to work in areas where a great deal is known, but it is worthwhile to define areas where greater information is needed. Information on data gaps can be extremely useful in establishing survey priorities, especially if combined with other factors such as development pressures. Two examples of areas under such pressures, yet with different amounts of information, illustrate this point.

A great deal of work has been accomplished in the Tucson Basin area, which allows archeologists to work with developers on advance planning for the treatment of archeological resources. Compromises on overall research goals and the extent of archeological research to be conducted may be achieved due to the amount known about the area. Greater emphasis can be placed on key research issues that have not yet been explored in detail, while other, more general research questions which have been examined extensively may be reviewed in less detail.

In contrast, much less work has been done along the Colorado River and to the east - areas considered part of the Western Desert of Arizona. The work that has been accomplished has been sporadic, and provides primarily survey information. Few sites have been excavated. Although overviews of the area have recently been completed (Stone 1986, 1987), in many ways these highlight the gaps in our knowledge of the prehistory of the region rather than fill in the blanks. The modern towns bordering the Colorado River are under immense development pressures and are expanding rapidly. Archeological work in these areas must still focus on broad research topics rather than on more specific ones. A comprehensive, synthetic study of the data collected to date, even though the majority is surficial information, is necessary to begin to understand some of the area's more ephemeral features (such as rock piles, rock rings, and trails).

Guide Research, Define Research Needs

Research objectives can be identified in planning. In the Tucson Basin area, for example, there is still a great deal to be learned about the latest period of Hohokam occupation, while the middle (Rincon) periods have been investigated to a much greater extent. In contrast, in the Western Desert area we are looking at a hunting and gathering society that left behind ill-defined

surface features. Not only do we need to learn more about the function of these features, but also how they relate to one another. For example, a GIS computer system which plots all known prehistoric trails or rock piles, overlain with topographic and vegetation data, could provide valuable information on population movements and subsistence of the prehistoric inhabitants. This does not mean that the Western Desert is a higher priority for research than the Tucson Basin, only that the current state of knowledge combined with management issues such as developmental pressures must be taken into account.

Data Centralization and Integration

One of the key ingredients of being able to identify data gaps and research needs is to centralize the data already collected, and to integrate different data sets. It is critical that a sound data base management system be developed in which data from all over the state and collected by different agencies can be stored. This should not only include artifactual and site data but also ethnobotanical, faunal, petrographic, and other data sets. Too often the specialized data collected are not integrated with other archeological data, thereby providing an incomplete picture of prehistory.

Management Needs

Management needs must also be taken into consideration. The State Plan should assist agencies in the management of cultural resources by identifying such matters as where more work is needed, and where a great deal is already known. This will prevent redundancy in data collection, enhance creativity of research, and address the overall research needs of the agency. For example, the plan could assist an agency in developing predictive models that draw together not only topographic features and known site data, but also research needs coupled with management goals.

In summary, state historic preservation planning should be an evolving process in which many factors come into play. By its very nature as a document for use on a statewide rather than regional basis, the State Plan overcomes the territorial or restrictive view which is often inherent in agencies' land-ownership patterns. State planning should be comprehensive, including not only descriptive information about the resources, but also assisting in identifying research that is needed. A plan is not meant to be an exclusionary document; that is, research not identified in the planning process can and should still be done. A plan sets priorities for research. These priorities change over time as our knowledge is enhanced. The document, therefore, is dynamic, assisting both researchers and managers in achieving their differing, yet overlapping, objectives.

COMPREHENSIVE PLANNING IN CALIFORNIA

Comprehensive planning as it is being applied in California provides one example of integrated research strategies, and of the factors that lead to their successful implementation. In 1986 a landmark meeting was held which included representatives from state and Federal land-managing agencies as well as private research organizations. This group of cultural resource professionals came to the meeting in agreement on two important points:

1. there is a need for the various agencies in California to pool resources in order to provide regional focus on specific research questions and management problems; and

2. interagency cooperation and support were essential for solving these problems.

Agreement on these two basic premises is fundamental to the success of any comprehensive historic preservation program, whether it is management- or research-oriented.

The Pacific Southwest Region of the Forest Service, as one of the largest land-managing agencies in California, joined this effort to explore opportunities for developing a more consistent, efficient approach to cultural resource management, and particularly to develop strategies for the programmatic identification, evaluation, and treatment of specific cultural properties (Lux, this volume). While the interagency team was initially concerned with properties that were threatened with destruction or other adverse impacts from land-disturbing activities, over time the emphasis shifted to developing a comprehensive plan for directing and systematizing the management of cultural resources. Each of the participating agencies was faced with similar problems, and was interested in cooperating to solve these problems.[8]

This effort was initiated in response to several concerns:

1. the need to establish professional agreement on priorities for the preservation of cultural resources;

2. the need and desire to consider various complementary approaches to state historic preservation planning that would meet short- and long-term goals;

3. the continued and intensifying pressures exerted by development interests and land-disturbing activities; and

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[8] Jackson, Robert. 1986. Meeting notes: a consideration of programmatic approaches to the management of archeological resources. Meeting held at the California Office of Historic Preservation, April 15, 1986, Sacramento.

4. the difficulties state and federal agencies were facing in complying with mandated historic preservation laws for their undertakings, and the problems faced in reviewing these projects.[9]

Archeologists and historic preservationists were being challenged to make major organizational and procedural changes in the conduct of cultural resource management. California, with its natural, cultural, economic, and political diversity, has presented complex problems with regard to establishing practical and functional planning throughout the state. An approach was needed which would increase predictability and efficiency in project planning and development, reduce inconsistency and delay in the review and compliance process, and simultaneously provide for the systematic collection of comparative research data and a unified, consistent approach to making historic preservation decisions.

It was agreed that many kinds of cultural resource properties offered a possibility of systematic treatment, and could be considered as representing an historic theme. These property types range from sparse lithic scatters to complex railroad logging systems, from tin can deposits to historic structures. After consensus was reached on the property types most appropriate for the initial effort, each agency took the responsibility for designing and implementing certain thematic comprehensive plans which would serve as models for future efforts. Other thematic designs that were of equal concern to several agencies are being developed by teams representing those agencies.

There are several benefits to this approach:

1. By agreeing that certain classes of properties can be evaluated and managed in a programmatic way, the Section 106 compliance process of the National Historic Preservation Act is facilitated. Rather than the fragmented, inconsistent approach that had been used, the thematic approach prioritizes where historic preservation efforts will be focused.

2. Standardized and consistent guidelines for evaluation and management decisions allow cultural resources managers to perform their jobs more efficiently.

3. Increasing information about priorities will help land managers incorporate historic preservation goals into the agency's broader mission.

4. Researchers will have access to more consistent, reliable data for study.

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[9]Gualtieri, Kathyrn. 1986. Personal correspondence. Department of Parks and Recreation, State of California. On file, Regional Office, USDA Forest Service, Pacific Southwest Region, San Francisco, California.

How, then, does this apply to an initiative for cultural resources research in the Forest Service? What lessons are to be learned? Historic resources do not usually correspond to today's political organizations. State Historic Preservation Offices review projects that affect cultural resources, and overall standards and guidelines for the profession are defined by the Secretary of the Interior. Cultural resources management is a multidisciplinary endeavor, requiring the expertise of archeologists, historians, and anthropologists. Cultural resources are, furthermore, only one of the resources that need to be considered in the agency's land management planning. Cultural resource management cannot function in administrative isolation.

In order for researchers successfully to develop methods and strategies for forest managers to implement on the ground, they will need to do so in a climate of cooperation with each of the various agencies, and involving the appropriate disciplines. For new methods to be widely accepted and supported within the Forest Service and by the professional and scientific community, a common agreement on priority problems will need to be the basis for work. A truly integrated approach is the only one that will succeed. Risks will be taken in the process and we will all have to agree in advance that the benefits of new knowledge make it worthwhile.

THE SOUTHWEST DIVISION, CORPS OF ENGINEERS, CULTURAL RESOURCES OVERVIEW

The Southwest Division, U.S. Army Corps of Engineers (COE), extends from the New Mexico/Arizona border into Arkansas and Louisiana, and covers approximately 25 percent of the continental United States. This vast expanse of territory includes a diversity of ecosystems, as well as archeologically-defined cultural systems and historically-recorded groups. The intensity of archeological investigations, the availability of reports, and the frequent lack of empirical data across the Southwest Division (SWD) run the full range from nonexistent to excellent. Over 65,000 sites have been entered into the New Mexico state site files and over 20,000 have been recorded in Arkansas. The numbers of sites, the variability of recorded data, and the range in quality (or even the existence) of syntheses prohibit meaningful understanding of prehistoric and historic adaptive strategies beyond any scale but local. Regional and panregional considerations can currently be addressed in only a cursory fashion.

It might be assumed that the archeological reports for Corps projects would not fit into this characterization but unfortunately most, if not all, of these criticisms are applicable to work done for the agency. COE projects reflect the growth of cultural resources management from the initial National Park Service-sponsored and

-funded work to the Corps' own programs. The reports vary in utility, data, and the presence or absence of meaningful research questions. Usually the only attempt at synthesis is a chronicle of culture history, slavishly repeated from report to report. Some reports do not even discuss prior investigations in a project area. It is rare for one firm to conduct all of the work on a project since funding extends over a period of years. The net result is a series of locality-specific reports united only by the fact that they present the work conducted at one project. In the case of the Corps, these projects are usually bands of territory extending three to six meters around a reservoir. The absence of syntheses and computerized data bases, combined with incomplete or disparate site records and reliance on individual memories for the histories of project-specific undertakings, lead to uneven resource management and an inability to deal effectively with such emergency situations as high spring runoff.

While the SWD owns an insignificant amount of land, it does have permitting requirements along major rivers, streams, and coast lines. On the one hand, this requirement does not dramatically increase the number of acres when compared to the overall size of the SWD. Yet on the other hand, SWD archeologists need to be aware of the full range of cultural and environmental variability within a district. Given the restricted area of responsibility (that is, reservoirs and areas close to rivers), it is essential to understand past cultural relationships, intensity of prior archeological undertakings, and relevant research issues in order to establish a context in which to evaluate an archeological site or sites. In view of the factors discussed above, this is extremely difficult, if not occasionally impossible, and a site must be evaluated with respect to itself and to generalized research issues.

The modern population within the SWD area is growing at an increasing rate. Undeveloped land and areas of difficult access are disappearing. The availability of comparatively small quantities of money for CRM requires that decisions be made concerning not only which sites are tested or excavated, but also the intensity of the work undertaken and the kinds of research questions which could or perhaps should be emphasized.

In an attempt to compile existing data and make it more readily available, and to inform SWD's executive-level management about archeological issues and requirements, several kinds of projects were considered. The one chosen evolved from a single, relatively simple, division-wide overview into the project that will be summarized below. This evolution resulted from the conditions discussed above - that is, the very large area, the disparate availability of information, the archeological diversity and, in the absence of syntheses, the need to integrate numerous scholars with a diversity of interests and backgrounds.

From the outset, the structure and integration of the project was of some concern. This was, in part, a reflection of the internal organization of the SWD. It consists of five districts covering all or parts of six states. Several districts include portions of two or three states. This organization presented the opportunity to structure the overviews to reflect the major geophysical settings, and not only to ignore modern political boundaries of states but also those of the COE's five districts. Thus the overviews were structured by the archeological and geophysical units which are commonly utilized by archeologists when considering prehistoric and historic adaptations.

In response to a request for proposals prepared by SWD chief archeologist Larry Banks, the Arkansas Archeological Survey was awarded a contract for the project. In order to prepare the required material effectively, subcontracts were awarded to institutions working in or familiar with the subregions within the Division. These included the Desert Research Institute, the Oklahoma Archeological Survey, the Texas Archeological Research Laboratory, and researchers from at least eight universities and the Smithsonian Institution.

The primary goal of the project was to produce five major documents. The first was a paleoenvironmental volume covering the entire SWD. To the extent possible, the prehistoric and early historic climatic and ecosystemic characteristics were to be discussed in as detailed a manner as the available literature permitted. Recommendations for future study and analyses were to be made.

Five overviews were written, corresponding to the subdivisions established for the project, of the prehistoric and historic archeology. An important concern was to integrate the overviews so that a level of comparability would be maintained across the Division. The diversity of backgrounds and research interests of over twenty major authors necessitated an integrative framework which would, if not achieve a synthesis, at least provide for a common treatment of the material. The overviews were structured around the concept of adaptation type (Fitzhugh 1975). Several authors expressed reservations but nevertheless complied with the structure. The generalized conceptual framework of adaptation type, which characterizes relationships among technology, adaptation, and environment, permitted regional summaries not weighed down in local issues of interpretation. While this results in a product of less utility to local specialists, it provides a compressed introduction to many parts of the country. This approach does not provide for detailed analyses or processual studies, but that was not the intent.

One primary topic, the bioarcheological knowledge within each overview area, was discussed by a specialist. Usually several chapters were devoted to the topic, including an attempt to determine such factual information as the number

of burials recovered, the number retained, their location, the number analyzed, and the kinds of analyses conducted on them. It would appear that smaller percentages were analyzed than one would assume, that the majority of the analyses are simple measurements, and that systematic investigations of paleopathologies, diseases, and genetic characteristics are rare.

In order to facilitate discussion and comparison, each prehistoric and historic adaptive type was summarized by eleven categories of information, including date range, environmental and cultural contexts, site types and their distributions, bioarcheology, sensitive areas of high site probability, data gaps, and critical research questions. Compilation of the material in this overview fashion permits a critical evaluation and some degree of quantification of what has been done and where. Fewer rigorous analyses have been undertaken than would be generally assumed.

A computerized, annotated, and fully cross-indexed bibliography of over 10,000 reports is being prepared. The indexing includes state, county, geographic coordinates, and attributes commonly recorded by archeologists such as site type, cultural affinity, and features. It is intended that this data base will be made available nationwide, although funding is not presently sufficient for this.

A computer file of site attributes was created. It is compatible with the Geographic Resources Analysis Support System (GRASS). The level of detail varies from site-specific location for over 20,000 sites in Arkansas (a project initiated by the Arkansas Archeological Survey for the National Park Service prior to involvement with the COE) to summary data by county for other areas. Site locations can be displayed by state or by county, or within specified geographical coordinates. Panregional categories of data can be displayed as color densities on accurate maps for the entire division or for any subdivision of interest. A set of variables (e.g., habitation sites with burials contrasted with centers of modern high population concentrations) can be displayed as color densities within each county in the SWD in a weighted fashion, so that counties in, say, New Mexico and Arkansas, can be compared or contrasted by color and density. The GRASS program is extremely powerful, is currently being upgraded, and - since it was developed with public funds - is free. It does require fairly sophisticated computer equipment.

Finally a short, executive-level summary will be prepared which discusses major geographical areas of the most immediate concern, major data gaps, research questions, and the current level of understanding of past adaptive strategies. It should be mentioned that this was the original and only document thought to be necessary when the project was first discussed.

It is important to point out what these documents are not. They are not COE reservoir-specific compilations and do not alleviate COE archeologists from the need to create reservoir- and project-specific research strategies for future work. Future research strategies can, however, be designed to address some of the data gaps and critical issues identified in the overviews.

It will be necessary to update the information as often as possible. While some have suggested five-year updates, a cycle with that periodicity would fail to take advantage of the flexibility of the system. It may be that certain kinds of information should be reviewed on a panregional basis every few years but newly acquired, essentially local data, must be entered quickly.

Interagency Cooperation

The SWD archeological overview provides an example of an integrated approach to a vast area and a large, complex body of data. Five major institutions and over twenty principal authors were involved. In an era of expanding land disturbance and restricted funding for cultural resources, integration of another sort must be attempted. Archeology is burdened by two dichotomies which are an amalgam of myth, reality, and perception. These are the separation of research from management and of academic researchers from cultural resource managers. Neither rift can ever be fully closed, but the perceived gaps must be narrowed through cooperation and communication. As long as management and research are played against each other, the cultural resources will suffer. Given the diversity and intensity of day-to-day impacts, the costs associated with archeological survey and mitigation, and the diversity of specialized analyses necessary for accurate reconstructions of past behavior, it is incumbent upon agencies and institutions to cooperate in conducting management and research projects whenever possible. Many agencies have land adjacent to and often within the boundaries of other agencies; however, projects are frequently conducted as if in a vacuum. Partially this is a problem of communication but it is also the result of differing agency missions.

All agencies are interested in doing more with less. No matter how large an archeological project, a number of fixed costs are always attendant, including those associated with administration and getting started. A greater portion of a small project budget goes to non-archeological tasks than is the case on a larger project. Cooperation, leading to economies of scale, would benefit the resource, the research, and the agencies involved.

Clearly certain projects are more amenable to cooperative efforts than others. For surveys along adjoining land jurisdictions, it would not be difficult to justify joint efforts. Specialized analyses leading to a determination of the utility of an approach or technique and/or the

building of a data base would also benefit from cooperation. Recently the Albuquerque District of the Corps of Engineers has been involved in archeological projects which would have been ideal for cooperative efforts. These included: (a) confirming obsidian hydration rates and the intensive dating of over 700 obsidian artifacts from 55 sites located at Abiquiu Reservoir immediately adjacent to Forest Service land in New Mexico; (b) an attempt to determine the utility and accuracy of thermoluminescence dating of burned caliche; (c) geomorphological reconstruction of the post-Pleistocene sequence on Air Force land 20 miles west of the Clovis sites at Blackwater Draw; and (d) an analysis of temporal characteristics of debitage from lithic scatters. While the overall success of these undertakings varied, their potential utility far exceeds the research needs of only the Corps. Additional funding for these kinds of projects would permit the incorporation of larger data sets and the delineation of associated problems, and would eventually produce more accurate bodies of data.

Interagency cooperation should be initiated on several levels. One of the easiest is for an agency that is well-staffed with archeologists to approach another with few archeologists, and offer expertise in survey, excavation, and research. The Albuquerque District has worked for the Air Force and the Department of Energy under such a program. Those agencies provided the funds and the Albuquerque District managed the undertakings.

From the perspective of an agency archeologist, the most important level at which to institute interagency cooperation would be Washington or a region, since district management is responsive to directives from above. On the other hand it is at these higher levels that funding and turf battles can be the most intense. At the district level cooperation should be easier to achieve but little funding is likely to be available.

The creation of a new program in the Forest Service's Rocky Mountain Research Station provides an opportunity to initiate a discussion of increasing cooperation at all levels of management. Agencies are always interested in long term, cost-effective approaches which could relieve some of the burden on a typically overworked staff. Creative approaches for providing money need to be considered, since annual budget requests are initiated two years in advance and are frequently pared down prior to the actual year of availability. If two agencies are planning jointly to fund a project, some mechanism must be developed so that both receive an appropriation that will allow each to fulfill the agreement.

INTEGRATING ACADEMIC AND MANAGEMENT ARCHEOLOGY

Forest managers - and other land managers - play a unique, powerful role in archeology because they control resources. Forest archeologists and Forest managers can make decisions that will greatly affect the future of American archeology. They can decide to protect some sites but not others. They can allow some archeologists to study Forest resources, but direct others to go elsewhere. And they can encourage certain lines of research while discouraging others. This is an enormous responsibility, yet it is one that is little understood.

One aspect of this problem is that state and Federal planning have not taken into account the diversity of approaches in the field. The struggles among proponents of different philosophical positions cannot be reduced to homogeneous historic themes of the sort that some planners advocate. It is therefore quite dangerous to use such plans to decide which research orientations should be supported and which should not. As compilations of data and summaries of research needs, such plans are quite useful. As an attempt to reduce planning and research decisions to a mechanical computation they are problematical.

Some archeologists, for example, are concerned with explaining why social systems develop and collapse. Others are preoccupied with learning what factors determine social structure and social change. Still others are concerned with understanding what people ate and what factors influenced how they made their tools and their art. No doubt these orientations overlap in many ways, but in the end they defy simple synthesis of the kind sometimes seen in plans.

In archeology, as in every science, knowledge increases and interpretations change over time. This is noticeable in such fields as physics and astronomy, but it is equally true of the social sciences. The Forest Service's research branch can - and should - play an important role in keeping agency archeologists abreast of the state of archeology, and of its ongoing evolution.

A program of integrated research could do much to bridge the chasm between agency and academic archeologists. There are two areas in which this might be accomplished. Firstly, the agency should encourage its archeologists to publicize their views, interpretations, and management priorities. They would subject themselves in this way to the standard controls of peer review and criticism. The Forest Service Research Stations could appropriately provide the forum that would make this possible. Peer review should be a central component of any cultural resources research program the agency might undertake.

Secondly, the research branch should develop a program of technology transfer, so that new developments in archeology can be disseminated to the management branch. One way to achieve this is through a "visiting scholars" program. In this program, management archeologists would be temporarily reassigned to a Research Station in order to participate in ongoing Station research, or to pursue limited research projects of their own devising. The overriding purpose of these temporary assignments would be to transfer new developments in knowledge and technology to management

archeologists. In returning to their permanent positions these individuals would then be able to apply the new knowledge and technology in better management of Forest resources.

DATA BASE MANAGEMENT

The primary underpinning of the decision-making system in any organization is the accuracy of its information base and its relative accessibility to the decision-maker. For the last decade and a half, the Forest Service cultural resource management program has been producing data about cultural properties on NFS lands as a result of thousands of surveys conducted for a wide variety of reasons (figs. 1 and 2). However, as pointed out in a 1986 CRM program review, rarely are these data utilized either in designing cultural resource management strategies or in directly supporting management decisions. The recommendation of that review was:

> Generally, Forests and Regions need to analyze the results of the inventory efforts that have been accomplished over the past decade. Both project and non-project inventory information needs to be used, rather than just filed, in order to direct future integrated resource management, and to assist in the evaluation and enhancement of cultural properties.[10]

One of the reasons for the failure to utilize these data is their relative inaccessibility. The computerization of these data is uneven across the National Forest System; some Regions have automated data bases for cultural properties, some have them for projects, some have them for both properties and projects, and some have neither. The same is true of the Forest Supervisors' offices. Even in those instances where automated systems exist, they do not appear to be used consistently and reliably in the decision-making process, particularly outside of the cultural resource management program.

Although the reasons for this failure can be understood in terms of staff and time limitations, it is more difficult to understand why the necessary resources have not been made available. Clearly it is not due to absence of the technology to develop such a decision-support system. The explosion of technological advances in the last decade has produced many exciting new ways of presenting cultural resource data that can directly support decision-making. Powerful and inexpensive portable and desktop microcomputers have been developed that permit rapid retrieval and display of information from a data base that would facilitate the decision-making process for both the specialist and the manager.

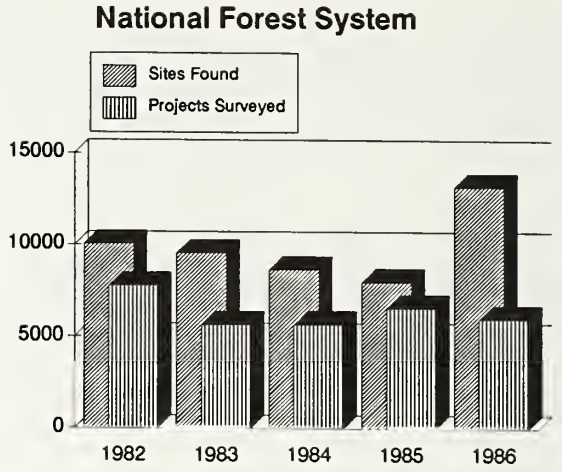

Figure 1.--Projects surveyed and sites found, USDA Forest Service, National Forest System, 1982-1986. Data on file, USDA Forest Service, Recreation Staff Unit, Washington, DC.

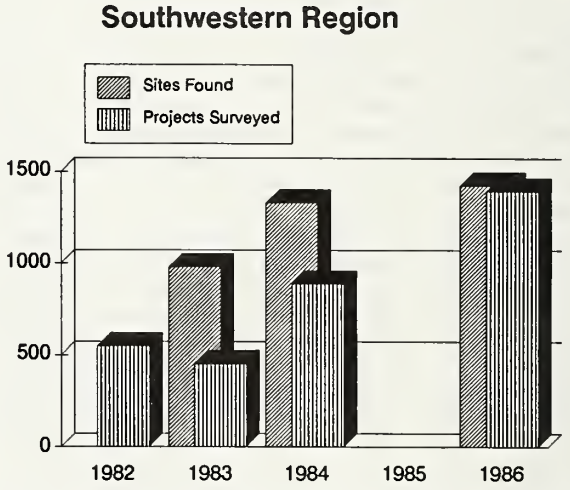

Figure 2.--Projects surveyed and sites found, USDA Forest Service, Southwestern Region, 1982-1986. (Data missing for 1985). Data on file, USDA Forest Service, Recreation Staff Unit, Washington, DC.

The first Forest Service CRM Program Review in 1976 identified the development and implementation of a CRM data base as a top priority. A task force was formed to address this issue; it recommended that each of the nine Regions develop and implement automated data base systems. After twelve years, relatively little has been done to meet this objective outside of Regions 3 and 4. Even in those Regions, major problems remain to be solved before the cultural resource data base becomes a useful tool in supporting the decision-making process.

It is not that management has not recognized the need for, and the advantages of, automated systems; many individual efforts have been made to bring some order and usefulness into data bases.

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[10] USDA Forest Service. 1986. Cultural resource management, program review, p. 9. On file, USDA Forest Service, Washington, DC.

A number of Forests have developed automated systems for their data, several Regions have struggled with data base development, and the Washington Office has organized numerous meetings and task forces to discuss the problem. States have developed data bases, the National Park Service is working on the development of national data bases for both properties and projects, and yet management continues to complain about the lack of decision-support information. The major barrier to achieving success in the development of an automated system for cultural resource information appears to be the absence of a large enough effort to accomplish the task. An effort by the Research Branch could accomplish what NFS has been unable to do because of the dispersion of its CRM resources across the system and the consequent difficulty it has had in assembling sufficient expertise and funding to define, design, and implement a CRM information management system.

It is clear from the discussions at this symposium that an underlying need of all the research topics is data bases that are accessible and that contain useful and reliable information on cultural resources. An immense amount of information has been collected over the past fifteen years that could provide a major tool in the management of cultural resources. This data base or data bases would provide the foundation for a myriad of research topics that would add to our understanding of the resource and improve management efficiency and effectiveness.

Such a data base in readily-accessible form would also permit better cooperation between Federal and state agencies in the management of cultural resources on a broad scale. Interagency cooperation in the use of data bases will provide a much-enhanced decision-support system. It will contain information that is better than that derived only from NFS land. This is an area that will greatly reward an integrated effort.

Until we can control and utilize the information that has been collected about cultural resources on the lands administered by the Forest Service, and on the lands administered by other federal and state agencies, we can take but small and tentative steps toward resolving the issues facing the management of the Nation's cultural resources.

An Example of Integrated Data Base Planning

One of the most promising technological developments in the past few years is the Geographical Information System (GIS). These computer programs offer ideal management decision-support systems, for they allow the retrieval and display of many kinds of information in a wide range of combinations (see Calamia, this volume). The Intermountain Region of the Forest Service is cooperating with other State and Federal agencies in Utah in a project to include the cultural resource information from all sites in San Juan County, southeastern Utah, in a GIS system that can be utilized by any and all of the participating parties in both the management of, and research on, the prehistoric resources of the county. Over 15,000 sites have been identified by the Forest Service, the Bureau of Land Management, the National Park Service, the Navajo Tribe, and the State Archeologist's Office. Information on roads and trails, elevation, soils, vegetation, streams, site surveys, and site characteristics and conditions are being entered into the data base. Once completed, a wide variety of questions can be addressed by these data. The Forest Service, among other agencies, is interested in developing models of site theft and vandalism, using such variables as vicinity to roads, visibility, site characteristics, and ruggedness of terrain to try to identify those sites most at risk from illegal activities. Once completed, this GIS data base can be used to address an almost endless series of questions of importance to both resource managers and researchers.

PROGRAM STRUCTURE

The elements of a successful program of integrated research include the right structure, the right people, sufficient funding, and agency support. Only the first item can be dealt with at this point.

To begin with, such a program should be explicitly linked to state historic preservation planning. A Forest Service program of integrated research can provide one means of developing and implementing a State Plan. The linkages among Forest Service management and research, state planning, and the management goals of other agencies should be specified in a Programmatic Memorandum of Agreement. This memorandum would specify, at a minimum, the following:

1. the program to be accomplished;

2. the roles and responsibilities of each party.

3. the mechanism whereby research designs will be developed; and

4. the means of implementation.

From the Forest Service's perspective this effort should be linked to the agency's land management planning process. On each Forest the Land Management Plan will specify, among other things, what the management needs are for cultural resources, and what research is needed to address those needs. Management issues can be addressed in such a plan at a finer level than is possible in a State Historic Preservation Plan. Yet Forest- and state-level planning should not proceed in isolation. Each should build upon the other. A program of integrated research can provide the link between these levels in such areas as data base management, designing joint research, technology transfer, identifying information needs, and coordinating results.

Developing a program structure will involve making decisions in the following areas:

Staffing. The options here are to base the program in the Forest Service research branch, or to do all or much of the work by contract. The former alternative is preferred. The requirements of this work are, firstly, that it be done by an archeologist who is knowledgeable about the Forest Service, and secondly, that it be done by someone who can devote undivided attention to it. These requirements are more likely to be met in a Forest Service employee than in a contracting institution. The reasoning behind these requirements has been detailed elsewhere (Tainter, this volume). To remain timely and useful, integrated research designs must be constantly evaluated and revised. This requires that the work be done by a specific individual who has no assignment of higher priority.

Development. Building integrated research designs is a political process. The goal is to engineer a consensus among archeologists about priorities in research and management. This can be done in several ways. Research designs can be developed by a single archeologist - a research czar - and imposed on the profession. At the opposite extreme the work can be done through a "town meeting" format, in which research is designed by anyone with an opinion to offer. Neither of these approaches is desirable. The research-czar approach will inevitably engender resentment among the specialists on whom the research design is imposed. The town-meeting format is a prescription for chaos, and for the selection of least-common-denominator topics.

It has been argued elsewhere that under the political structure of archeology - which is a discipline characterized by low theoretical consensus and few leaders - the best approach to designing research is by a designated group of the leaders of the field (Tainter n.d.). Accordingly, it is recommended that the following steps be taken to develop research designs.

1. Divide the Southwest into geographical subunits appropriate to research and management.

2. In each geographical subarea, organize a committee of the leading scholars to develop integrated research designs.

3. Once these scholars have prepared draft research designs, convene an open symposium of all interested persons to debate the merits of the proposed designs.

4. Based on the outcome of the symposium, revise the proposed designs, if necessary. Proceed to implement the final designs to guide survey, excavation, data base management, and preservation decisions.

Scheduling. Management through integrated research must be sensitive to the dynamic nature of archeological science. Nothing could be worse than the image of a fossilized government agency making management decisions by outdated criteria. Two steps must be taken to avoid this: (1) begin such a program with the realization that it must be continuously evaluated and revised, and that this will require continuous funding; and (2) build an automatic termination date into each research design. The latter point is critical. After a research design has been in effect for, say, 24 months, the project archeologist should begin to evaluate its results and usefulness, and whether it is still current in archeology. After 36 months the research design should automatically terminate, as should all management decision-making criteria based on it. At this point one of three steps should be taken. As appropriate, the research design can be reissued as is; or it can be modified and reissued; or if it is obsolete, it should be discarded altogether. It would be irresponsible to develop integrated research designs without provision for continuous appraisal and automatic termination.

RECOMMENDATION

A great many topics have been touched on in this paper. We have outlined the need for integrated research designs, and the advantages they confer. We have also recommended several steps that the research branch of the Forest Service could take to gain these advantages. We see three major actions that the research branch could undertake to facilitate integrated research.

1. Serve as the coordinating agency for a program of integrated research that incorporates Federal agencies, State Historic Preservation Offices, and non-government archeologists.

2. Support a program to transfer technology to the management branch.

3. Develop a cultural resources decision-support system (a data base) that will allow managers and researchers alike to access cultural resources information readily.

While all of these are important tasks that the research branch should undertake at some point, the last item seems to be the most urgent. For reasons discussed above, a cultural resources data base to support decision-making and research is one of the agency's most critical needs. It could provide management with greater use of existing data, and would be the first step toward an integrated research program. The development of a GIS data base system is accordingly the task that we recommend be undertaken first.

CONCLUDING REMARK

As outlined in these pages, a program of integrated research presents a challenge to a Federal agency that faces a convergence of increasing responsibilities and declining funds, and that must make irrevocable preservation decisions. Yet in that challenge lies an opportunity to develop an exemplary program of cultural resources management, and to make an investment that will yield dividends for decades to come.

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Rocky Mountains

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